PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-117008

(43)Date of publication of application : 02.05.1997

(51)Int.Cl. B60L 11/14
B60K 6/00
B60K 8/00
F02D 29/06

(21)Application number : 07-265412

(22)Date of filing : 13.10.1995

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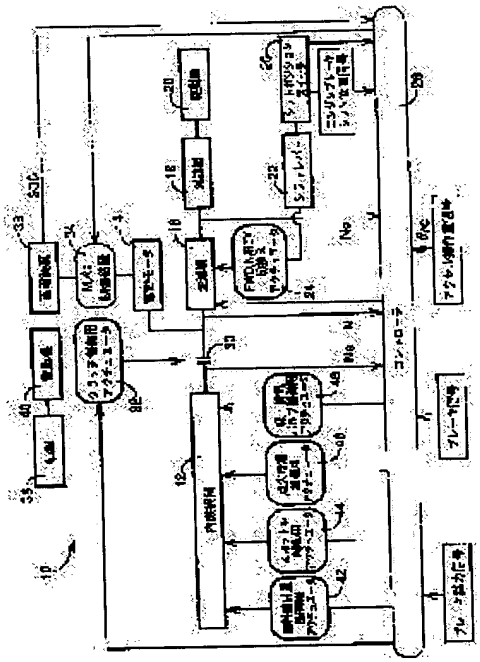
(54) HYBRID DRIVER

(57)Abstract:

PROBLEM TO BE SOLVED: To make it possible to satisfactorily run a hybrid driver by using the other even if either an internal combustion engine or an electric motor is defective, in the driver which runs by using the motor in a light load range or by using the engine in a heavy load range.

SOLUTION: When an internal combustion engine 12 is defective, the hybrid driver runs by an electric motor 14, the output range of the motor 14 is extended to the heavy load side, and the gear shifting map of the transmission 16 is so altered as to conduct the gear shifting control adapted to the output range. When the motor 14 is defective, the driver runs by the engine 12, the output range of the engine 12 is extended to the light load side, and the map of the transmission 16 is so altered as to conduct the gear shifting control adapted to the output range.



LEGAL STATUS

[Date of request for examination] 23.06.1999

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CLAIMS

[Claim(s)]
[Claim 1] The engine which operates by combustion of a fuel, and the accumulation-of-electricity equipment with which electrical energy is charged based on rotation of this engine, While having the motor which takes out electrical energy from this accumulation-of-electricity equipment, and operates and using this engine and a motor as a driving source at the time of car transit In the hybrid driving gear with which the engine drive field by the side of the heavy load it runs using the motor driver zone and this engine by the side of the low loading it runs only using this motor according to operational status was appointed beforehand At the time of the transit using the driving source of said another side by the drive control means, at a drive control means and the time of this failure at the time of the failure which uses and runs the driving source of another side when either said motor or said engine breaks down The hybrid driving gear characterized by having a driver zone modification means to change the driver zone by the driving source of this another side.
[Claim 2] Said driver zone modification means is a hybrid driving gear according to claim 1 which is a thing including an engine power limited modification means to expand the output limitation by the side of the low loading of this engine corresponding to said engine drive field to a low loading side when the driving source of said another side is said engine.
[Claim 3] Said driver zone modification means is a hybrid driving gear according to claim 1 or 2 which is a thing including a motor-output limited modification means to expand the output limitation by the side of the heavy load of this motor corresponding to said motor driver zone to a heavy load side when the driving source of said another side is said motor.
[Claim 4] Said driver zone modification means is a hybrid driving gear according to claim 1 or 2 which is a thing including a motor-output limited modification means to reduce the output limitation by the side of the heavy load of this motor corresponding to said motor driver zone to a low loading side when the driving source of said another side is said motor.
[Claim 5] The engine which operates by combustion of a fuel, and the accumulation-of-electricity equipment with which electrical energy is charged based on rotation of this engine, It has the motor which takes out electrical energy from this accumulation-of-electricity equipment, and operates, and the change gear which changes a change gear ratio according to operational status while transmitting rotation of said engine as a driving source and said motor to a wheel side. In the hybrid driving gear which uses properly and runs said motor and said engine according to operational status At the time of the transit using the driving source of said another side by the drive control means, at a drive control means and the time of this failure at the time of the failure which uses and runs the driving source of another side when either said motor or said engine breaks down The hybrid driving gear characterized by having a gear change control means at the time of the failure which changes the relation of said operational status and said change gear ratio.
[Claim 6] The engine which operates by combustion of a fuel, and the accumulation-of-electricity equipment with which electrical energy is charged based on rotation of this engine, In the hybrid driving gear have the motor which takes out electrical energy from this accumulation-of-electricity equipment,

and operates, and the change gear which can change a change gear ratio, and using this motor as a driving source at the time of car transit at least So that the amount of electrical energy which said motor consumes may become small, when said engine breaks down The hybrid driving gear characterized by having the energy-saving gear change control means which controls the change gear ratio of this change gear in consideration of either [at least] the power transmission efficiency of said change gear, or the energy conversion efficiency of said motor.

[Claim 7] The engine which operates by combustion of a fuel, and the accumulation-of-electricity equipment with which electrical energy is charged based on rotation of this engine, While having the motor which takes out electrical energy from this accumulation-of-electricity equipment, and operates and using this motor as a driving source at the time of car transit at least In the hybrid driving gear with which the amount of the minimum accumulation of electricity of this accumulation-of-electricity equipment with which taking out electrical energy from said accumulation-of-electricity equipment in order to operate this motor is permitted is set up The hybrid driving gear characterized by having the amount modification means of the minimum accumulation of electricity which lowers the amount of the minimum accumulation of electricity of said accumulation-of-electricity equipment when said engine breaks down.

[Claim 8] The engine which operates by combustion of a fuel, and the generator which generates electrical energy by carrying out a rotation drive with this engine, The accumulation-of-electricity equipment which accumulates the electrical energy taken out with this generator, In the hybrid driving gear have the motor which operates with the electrical energy accumulated in the electrical energy taken out with said generator, and/or said accumulation-of-electricity equipment, and using this motor as a driving source at the time of car transit When said engine or said generator breaks down, at the time of the failure by the side of the low loading defined beforehand in the range of a driver zone The hybrid driving gear characterized by having a motorised control means at the time of the failure which you take [failure] out all electrical energy required for actuation of said motor from said accumulation-of-electricity equipment, and makes it run a car with this motor.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the hybrid driving gear which has an engine and a motor, and especially, with a parallel mold, when either an engine and a motor break down, when an engine or a generator breaks down, it relates to the technique it enables it to run to the predetermined destination, respectively in a series mold.
[0002]
[Description of the Prior Art]
(a) The engine which operates by combustion of a fuel, and (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) While having the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates and using the engine and motor as a driving source at the time of car transit The so-called parallel type with which the engine drive field by the side of the heavy load it runs using the motor driver zone and engine by the side of the low loading it runs only using a motor according to operational status was appointed beforehand of hybrid driving gear is indicated by JP,5-50865,A. Moreover, (a) The engine which operates by combustion of a fuel, and (b) The generator which generates electrical energy by carrying out a rotation drive with the engine, (c) Accumulation-of-electricity equipment which accumulates the electrical energy taken out with the generator, (d) It has the motor which operates with the electrical energy accumulated in the electrical energy taken out with said generator, and/or said accumulation-of-electricity equipment, and the so-called series type using the motor as a driving source at the time of car transit of hybrid driving gear is also proposed. In addition, the so-called parallel series mold which enabled it to use the engine in what [what combined the parallel mold with this series mold], i.e., the above-mentioned series mold hybrid driving gear, as a driving source apart from a motor is also proposed.
[0003]
[Problem(s) to be Solved by the Invention] When either an engine or a motor breaks down, it may be unable to become transit impossible, or it becomes impossible to secure sufficient mileage and may be able to stop however, being able to reach to the predetermined destination in the hybrid driving gear of the above-mentioned parallel mold. Since it charges using rotation of an engine or regenerative braking, it becomes insufficient by failure of an engine charging accumulation-of-electricity equipment, and it becomes impossible for example, to have to run with a motor, if an engine breaks down, but to secure sufficient mileage, while its torque is insufficient at the time of heavy loads, such as a climb way, and it becomes transit impossible at it, since the motor driver zone which runs with a motor is a low loading field. Moreover, when a motor breaks down, it must run with an engine, but since the engine drive field which runs using an engine is a heavy load field, low loading transit, i.e., the low-speed transit at the time of start and a halt etc., is impossible, and it serves as transit impossible substantially. Furthermore, in the hybrid driving gear which has the change gear with which a change gear ratio is changed according to operational status, if a change gear ratio is changed like always [forward] according to

operational status, such as an accelerator control input, even when one side of a driving source breaks down, performance-traverse ability is spoiled greatly, without the power and the change gear ratio which are transmitted from a driving source matching, it will become transit impossible or mileage will fall remarkably.

[0004] In the case of the hybrid driving gear of a series mold, if the motor which is a driving source breaks down, naturally it will become transit impossible, but even when an engine and a generator break down, the supply of the electrical energy from a generator by which a rotation drive is carried out with an engine is intercepted, and since a motor is operated with the electrical energy of accumulation-of-electricity equipment, if heavy load transit with bad energy efficiency is performed, sufficient mileage cannot be secured chiefly. Moreover, when the rate of the amount taken out from accumulation-of-electricity equipment among electrical energy required for actuation of a motor is controlled, by intercepting supply of the electrical energy from a generator, the electrical energy supplied to a motor runs short, sufficient output is no longer obtained, and running may become impossible.

[0005] With a parallel mold, when either an engine and a motor break down, the place which succeeded in this invention against the background of the above situation, and is made into the purpose is in a series mold, to enable it to run to the predetermined destination, respectively, when an engine or a generator breaks down.

[0006]

[Means for Solving the Problem] The 1st invention is (a) in order to attain this purpose. The engine which operates by combustion of a fuel, (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) While having the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates and using the engine and motor as a driving source at the time of car transit In the hybrid driving gear with which the engine drive field by the side of the heavy load it runs using the motor driver zone and engine by the side of the low loading it runs only using a motor according to operational status was appointed beforehand (d) At the time of the failure which uses and runs the driving source of another side when either said motor or said engine breaks down, drive control means, (e) At the time of the transit using the driving source of said another side by the drive control means, it is characterized by having a driver zone modification means to change the driver zone by the driving source of the another side at the time of the failure.

[0007] The 2nd invention is characterized by said driver zone modification means being a thing including an engine power limited modification means to expand the output limitation by the side of the low loading of the engine corresponding to said engine drive field to a low loading side when the driving source of said another side is said engine in the hybrid driving gear of the 1st invention of the above.

[0008] The 3rd invention is characterized by said driver zone modification means being a thing including a motor-output limited modification means to expand the output limitation by the side of the heavy load of the motor corresponding to said motor driver zone to a heavy load side when the driving source of said another side is said motor in the hybrid driving gear of said 1st invention or the 2nd invention.

[0009] The 4th invention is characterized by said driver zone modification means being a thing including a motor-output limited modification means to reduce the output limitation by the side of the heavy load of the motor corresponding to said motor driver zone to a low loading side when the driving source of said another side is said motor in the hybrid driving gear of said 1st invention or the 2nd invention.

[0010] The 5th invention is (a). The engine which operates by combustion of a fuel, and (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) The motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates, (d) It has the change gear which changes a change gear ratio according to operational status while transmitting rotation of said engine as a driving source and said motor to a wheel side. In the hybrid driving gear which uses properly and runs said motor and said engine according to operational status (e) At the time of the failure which uses and runs the driving source of another side

when either said motor or said engine breaks down, drive control means, (f) At the time of the transit using the driving source of said another side by the drive control means, it is characterized by having a gear change control means at the time of the failure which changes the relation of said operational status and said change gear ratio at the time of the failure.
[0011] The 6th invention is (a). The engine which operates by combustion of a fuel, and (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) In the hybrid driving gear have the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates, and the change gear which can change a change gear ratio, and using this motor as a driving source at the time of car transit at least (d) So that the amount of electrical energy which said motor consumes may become small, when said engine breaks down It is characterized by having the energy-saving gear change control means which controls the change gear ratio of this change gear in consideration of either [at least] the power transmission efficiency of said change gear, or the energy conversion efficiency of said motor.
[0012] The 7th invention is (a). The engine which operates by combustion of a fuel, and (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) While having the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates and using the motor as a driving source at the time of car transit at least In the hybrid driving gear with which the amount of the minimum accumulation of electricity of the accumulation-of-electricity equipment with which taking out electrical energy from said accumulation-of-electricity equipment in order to operate the motor is permitted is set up (d) When said engine breaks down, it is characterized by having the amount modification means of the minimum accumulation of electricity which lowers the amount of the minimum accumulation of electricity of said accumulation-of-electricity equipment.
[0013] The 8th invention is (a). The engine which operates by combustion of a fuel, and (b) The generator which generates electrical energy by carrying out a rotation drive with the engine, (c) Accumulation-of-electricity equipment which accumulates the electrical energy taken out with the generator, (d) It has the motor which operates with the electrical energy accumulated in the electrical energy taken out with said generator, and/or said accumulation-of-electricity equipment. It sets to the hybrid driving gear using the motor as a driving source at the time of car transit, and is (e). When said engine or generator breaks down, at the time of the failure by the side of the low loading defined beforehand in the range of a driver zone It is characterized by having a motorised control means at the time of the failure which you take [failure] out all electrical energy required for actuation of said motor from said accumulation-of-electricity equipment, and makes it run a car with the motor.
[0014]
[Effect of the Invention] When the hybrid driving gear of the 1st invention of the above is a parallel mold and either a motor or an engine breaks down While running using the driving source of another side by the drive control means at the time of failure Since the driver zone by the driving source of the another side is changed into the field which differs from always [forward] with a driver zone modification means, the transit of it under the transit conditions which were impossible for the conventional transit can be attained, or it can secure sufficient mileage, and can run mileage to the predetermined destination.
[0015] For example, it becomes possible to perform low loading transit at the time of start and a halt etc. by making an engine into a driving source by expanding the output limitation by the side of the low loading of the engine set up like the 2nd invention corresponding to the engine drive field to a low loading side at the time of failure of a motor. By expanding the output limitation by the side of the heavy load of the motor set up like the 3rd invention corresponding to the motor driver zone to a heavy load side at the time of failure of an engine By becoming possible to perform heavy load transit of a climb way etc. by making a motor into a driving source, and reducing the output limitation by the side of the heavy load of the motor set up like the 4th invention corresponding to the motor driver zone to a low loading side The consumption of the electrical energy by the motor is reduced and mileage sufficient with the electrical energy with which accumulation-of-electricity equipment was restricted can be

secured now.
[0016] When the hybrid driving gear of the 5th invention is a parallel mold and either a motor or an engine breaks down While running using the driving source of another side by the drive control means at the time of failure Since the relation between operational status and a change gear ratio is changed by the gear change control means at the time of failure at the time of the failure, When running only by the driving source of another side, suitable gear change control is able to be made to be performed in respect of the consumption of electrical energy, performance-traverse ability, etc. The transit under the transit conditions which were conventionally impossible for transit can be attained, or sufficient mileage can be secured, and it can run now to the predetermined destination.
[0017] Mileage sufficient with the electrical energy with which the consumption of the electrical energy according to a motor since the change gear ratio of a change gear is determined that the amount of electrical energy which a motor consumes by the energy-saving gear change control means when, as for the hybrid driving gear of the 6th invention, neither of a parallel mold and series mold interferes and an engine breaks down will become small was reduced, and accumulation-of-electricity equipment was restricted can be secured now, and it can run now to the predetermined destination.
[0018] Since the amount of the accumulation-of-electricity equipment with which taking out electrical energy from accumulation-of-electricity equipment in order to operate a motor is permitted of the minimum accumulation of electricity is lowered by the amount modification means of the minimum accumulation of electricity when neither a parallel mold nor a series mold interfere and an engine breaks down, the hybrid driving gear of the 7th invention becomes possible [taking out so much electrical energy from accumulation-of-electricity equipment], can fully secure the mileage it can run with a motor, and can run mileage to the predetermined destination.
[0019] The hybrid driving gear of the 8th invention is a series mold, and since a car is run by the motor in the range of a driver zone at the time of the failure by the side of low loading when an engine or a generator breaks down, even if the consumption of the electrical energy by the motor is reduced and supply of the electrical energy from a generator is intercepted, it can secure mileage sufficient with the electrical energy with which accumulation-of-electricity equipment was restricted. Moreover, since it is controlled to take out all electrical energy required for actuation of a motor from accumulation-of-electricity equipment, it is avoided that running becomes impossible insufficient [supply of the electrical energy to a motor] therefore. Thereby, even when electrical energy is no longer charged by accumulation-of-electricity equipment by failure of an engine or a generator, it can reach to the predetermined destination.
[0020]
[Embodiment of the Invention] Here, the engine drive field in the hybrid driving gear of the 1st invention should just be a field which the thing which runs as a driving source both the thing which runs only an engine as a driving source or an engine, and a motor may also consist of the field of the both, and runs also a thing using an engine at least. By arranging a generator separately from a motor, for example, using said motor as a generator, and carrying out the rotation drive of the generator with regenerative braking and the engine of a car, accumulation-of-electricity equipment is constituted so that it can charge if needed. Although actuation of the motor in a motor driver zone takes out all required electrical energy from accumulation-of-electricity equipment, it may use the electrical energy generated by carrying out the rotation drive of the generator with an engine. Even if motors including other invention are arranged by two or more driving wheels, respectively, you may be constituted so that the rotation drive of two or more driving wheels may be carried out with a single motor, but when it has the change gear which can change a change gear ratio, it is desirable to constitute so that the rotation drive of two or more driving wheels with a single motor may be carried out.
[0021] Although the motor driver zone and engine drive field which are appointed according to operational status are set up considering driving torque, the vehicle speed, etc. as a parameter with a power requirement required for transit of a car, even if this is defined by limiting the output area of a motor and an engine and sets up a motor driver zone and engine drive fields, such as this, in the output area of the motor which is a driving source, and an engine so that fuel consumption and the amount of

exhaust gases may decrease as much as possible, it does not interfere. Although a driver zone modification means changes output limitation of a motor or an engine like the 2nd invention - the 4th invention, when it has the change gear which can change a change gear ratio, it may change a driver zone into a high torque low vehicle speed or low torque quantity vehicle speed side by changing the change gear ratio. Generally the capacity of the motor to be used is defined in consideration of the generation of electrical energy at the time of regenerative braking, and since it is an output area lower enough than the maximum output, even if a motor driver zone, i.e., the limited output area of a motor, expands the output limitation by the side of the heavy load of a motor to a heavy load side like the 3rd invention, it can operate a motor continuously.

[0022] Moreover, although there are two kinds, the case where it uses and runs an engine on the occasion of implementation of the 1st invention at the time of failure of a motor, and when using and running a motor at the time of failure of an engine, what has one of the functions may have both functions. The same is said of the 5th invention.

[0023] Although modification of the output limitation in the 2nd invention - the 4th invention may be beforehand memorized in the form of a data map etc. as a limited output area at the time of failure, it can adopt various modification gestalten, such as what adds a predetermined value to the output limited value of forward always, subtracts, or multiplies by it and changes a predetermined rate. When a motor breaks down, it is determined that the low-speed transit which the output limitation by the side of engine low loading is expanded to a low loading side, and stops [stop and it departs / transit] a car smoothly is possible, but the driver zone modification means of the 2nd invention is included in this invention, also when losing the limitation by the side of low loading. Although the driver zone modification means of the 3rd invention expands the output limitation by the side of the heavy load of a motor to a heavy load side when an engine breaks down On the occasion of modification of the output limitation by the side of this heavy load, the predetermined vehicle speed Y (km/h) is obtained, for example under the transit conditions predetermined [, such as X etc. degrees,] in inclination, Or things set up so that the predetermined minimum service condition may be satisfied -- predetermined acceleration Z (G) is obtained at the time of the start under predetermined transit conditions -- are desirable. In addition, although the output limitation by the side of low loading, i.e., low-power output, and the output limitation by the side of a heavy load, i.e., high power, are changed in the 2nd invention - the 4th invention, like the case where a change gear ratio is changed on the occasion of implementation of the 1st invention, the magnitude of the output of an engine or a motor itself is the same, and it is also possible to change an output area into a high vehicle speed low torque and/or low vehicle speed quantity torque side.

[0024] The change gear of the 5th invention and the 6th invention may be a nonstep variable speed gear from which a change gear ratio changes continuously, even if a change gear ratio is the owner stage change gear which changes gradually. In the case of an owner stage change gear, it is set up on the gear change map which makes a parameter for example, an accelerator control input, the vehicle speed, etc., the relation, i.e., the gear change conditions, of the operational status and the change gear ratio in the 5th invention, and, in the case of a nonstep variable speed gear, it is determined that the operation expression which makes a parameter the accelerator control input, vehicle speed, etc. determines a change gear ratio. And at the time of failure, when running only by the driving source of another side, a gear change control means is set that suitable gear change control is performed in the field of the accelerator control input from which the output specifically changes so that suitable gear change control may be performed, for example, so that suitable gear change control may be performed in the output area of the driving source of another side. Namely, the hybrid driving gear of a parallel mold Operational status is embraced. An accelerator control input below a predetermined value A motor driver zone, Beyond a predetermined value is determined as an engine drive field etc., and at the time of an engine failure, when output limitation of a motor is changed like the 3rd invention or the 4th invention beyond a predetermined value, an accelerator control input Above the new predetermined value accompanying the modification, in order not to stick and change to the maximum of the limited output area of a motor, suitable gear change control is made to be performed in the field of the

accelerator control input from which an output changes. It is also the same as when running with an engine at the time of failure of a motor. In addition, what is necessary is it to be also possible for to amend the map which asks for a power requirement required for transit of a car, operation expression, etc., and just to also set up gear change control of a change gear in 0 - 100% of range in that case so that it may become the minimum value of an engine limited output area when an accelerator control input is 0% at the time of motor failure so that it may become the maximum of the limited output area of a motor, when an alkali-cellulose control input is 100% at the time of an engine failure.

[0025] Moreover, since high power is not obtained at the time of the above-mentioned failure when an engine breaks down and a gear change control means runs only with a motor, For example, the thing acquired for the vehicle speed Y predetermined in changing a change gear ratio and gear change conditions **** in the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination (km/h) so that it can run also a climb way certainly and may become a low gear from the case of the usual gear change conditions, Or the thing acquired for predetermined acceleration Z (G) at the time of the start under predetermined transit conditions, It enables it to perform gear change control, or various modes -- gear change control is made to be performed so that the predetermined minimum service condition may be satisfied and the consumption of the electrical energy by the motor may become small like the 6th invention -- can be adopted. Moreover, at the time of failure of a motor, a change gear ratio and gear change conditions are changed, or even if an engine is operated in the engine drive field for example, by the side of a heavy load, it is constituted so that fuel consumption effectiveness or exhaust-gas effectiveness with an engine may become high and gear change control may be performed, so that it may become a low gear from the case where they are the usual gear change conditions, so that the low-speed transit at the time of start and a halt etc. may be possible. At the time of this failure, although the gear change control means may also memorize beforehand the relation between the gear change conditions at the time of failure, i.e., operational status, and a change gear ratio in the form of a data map etc., it can adopt various modification gestalten, such as what adds a predetermined value to the gear change conditions of forward always, subtracts, or multiplies by it and changes a predetermined rate. Moreover, it combines with modification of output limitation of the engine of the 2nd invention - the 4th invention, or a motor, and this 5th invention can be carried out.

[0026] When an engine breaks down, the energy-saving gear change control means of the 6th invention is constituted so that the amount of electrical energy which a motor consumes may become small, and it may become min desirably, and the change gear ratio of the change gear may be controlled in consideration of either [at least] the power transmission efficiency of a change gear, or the energy conversion efficiency of a motor. Like the 5th invention of the above, when carrying out gear change control according to operational status, in consideration of either [at least] the power transmission efficiency of a change gear, or the energy conversion efficiency of a motor, gear change control can also be performed according to a gear change map etc. at the time of the failure beforehand set up so that the consumption of electrical energy might become small. It combines with the 1st invention - the 5th invention, and this 6th invention can be carried out. Moreover, although the hybrid driving gear of the 6th invention does not interfere with a parallel mold or a series mold, either, it is desirable that it is made to perform the above gear change control in the hybrid driving gear of a series mold not only at an engine but at the time of failure of a generator.

[0027] In order to operate a motor at the time of failure of an engine, taking out electrical energy from accumulation-of-electricity equipment lowers the amount of the minimum accumulation of electricity permitted, but the amount modification means of the minimum accumulation of electricity of the 7th invention is included in this invention, also when losing the limit about the amount of the minimum accumulation of electricity. If taking out electrical energy is permitted even if accumulation-of-electricity equipment becomes about 70% or less which is the amount of the minimum accumulation of electricity at the time of an engine failure, since it is generally used in consideration of an energy conversion efficiency, a life, etc. in 70% - about 80% of accumulation-of-electricity range, mileage will be extended sharply. It combines with the 1st invention - the 6th invention, and this 7th invention can be carried out. Moreover, the hybrid driving gear of this 7th invention does not interfere with a parallel

mold or a series mold, and also when not only an engine but a generator breaks down at the hybrid driving gear of a series mold, it is desirable to make it lower the amount of the minimum accumulation of electricity of accumulation-of-electricity equipment.

[0028] Although the rotation drive of the generator is carried out with an engine in all the driver zones that are series molds and run a motor as a driving source and the hybrid driving gear of the 8th invention generates electrical energy for example, operational status in the driver zone of the low loading set up beforehand While suspending an engine and taking out all electrical energy required for a motor from said accumulation-of-electricity equipment An engine is operated from it in the driver zone of a heavy load, and when the electrical energy remained and it is [it charges and] insufficient for accumulation-of-electricity equipment, you may make it take out from accumulation-of-electricity equipment, while a motor is operated using the electrical energy taken out with the generator. Moreover, only a motor needs to be used as a driving source in no driver zones, and it is also possible to constitute so that only an engine can use an engine and a motor as a driving source in a predetermined driver zone. It combines with the 6th invention or the 7th invention, and this 8th invention can be carried out. In addition, when it has a change gear, it is desirable to establish a gear change control means at the time of the same failure as the 5th invention so that gear change control suitable also at the time of the failure to which the operating space of an electric motor is limited to a low loading side may be performed.

[0029] Hereafter, the example of this invention is explained to a detail based on a drawing. Drawing 1 is a block diagram explaining the configuration of the hybrid driving gear 10 of a parallel mold, mechanical joint relation is shown by the thick continuous line, and electric joint relation is shown by the thin line. This hybrid driving gear 10 is equipped with the internal combustion engines 12, such as a gasoline engine which operates by combustion of a fuel, and the electric motor 14 as a motor which operates with electrical energy as a driving source, and the power of the internal combustion engines 12, such as it, and an electric motor 14 is transmitted to a change gear 16 that it is simultaneous or alternatively, and is further transmitted to the driving wheel 20 on either side through a reducer 18, the differential machine which is not illustrated. The change gear 16 has the owner stage change gear style which forms advance (FWD), go-astern (REV), and two or more advance gear ratios from which the pre-go-astern change-over device which switches a neutral (N), and a change gear ratio differ, and when a shift lever 22 is operated by the operator, advance, go-astern, and a neutral are switched by the change actuator 24. Moreover, the signal showing the shift position of a shift lever 22 is supplied to a controller 28 from a shift position switch 26, and change control of a gear ratio is performed according to the shift position. In addition, although the clutch 30 which connects power transfer and is intercepted is formed between the above-mentioned internal combustion engine 12 and the change gear 16 and intermittence control is carried out by the actuator 32 for clutch control, it is usually held at a connection condition.

[0030] The above-mentioned electric motor 14 is connected to the accumulation-of-electricity equipments 36, such as a dc-battery and a capacitor, through the M(motor)/G (generator) control device 34. The rotation drive condition by which electrical energy is supplied from accumulation-of-electricity equipment 36, and a rotation drive is carried out with predetermined torque, It is switched to accumulation-of-electricity equipment 36 by the charge condition of charging electrical energy, and the unloaded condition which permits that a motor shaft rotates freely by functioning as a generator by regenerative braking (electric damping torque of electric motor 14 the very thing). Moreover, as for said internal combustion engine 12, an operating state is controlled by the actuator 42 for fuel-oil-consumption control, the actuator 44 for throttle control, the actuator 46 for ignition timing control, **, the actuator for exhaust air valve controls 48, etc., and actuators, such as it, are controlled by the controller 28 with the above-mentioned M/G control unit 34. In addition, the motor 40 for driving the auxiliary machinery 38, such as a compressor of an air-conditioner, is electrically connected to the above-mentioned accumulation-of-electricity equipment 36.

[0031] A controller 28 is constituted including the microcomputer which has CPU, RAM, ROM, etc., and performs the flow chart shown in drawing 2 - drawing 5 by performing signal processing according to the program set up beforehand. For this controller 28, an engine speed Ne and the input rotational frequency (motor rotational frequency) nickel of a change gear 16 The information about the amount

SOC of accumulation of electricity of the output rotational frequency (it corresponds to the vehicle speed V) No, and accumulation-of-electricity equipment 22, The accelerator control input signal showing accelerator control input thetaAC, the brake signal showing the operator having broken in and operated the brake pedal, The brake treading strength signal showing the treading strength, the engine brake shift-position signal showing being the shift position on which engine brake is made to act, etc. are supplied from various kinds of detection means etc. The amount SOC of accumulation of electricity is calculated from a motor current, charging efficiency, etc. at the time of the charge as which an electric motor 14 functions as a generator.

[0032] drawing 2 -- the basic flow chart of this example -- it is -- step S1 -- accelerator control input thetaAC, an engine speed Ne, the input engine speed nickel, the output engine speed No, the amount SOC of accumulation of electricity, an engine torque TE, and motor torque TM etc. -- data are read. Engine torque TE It asks from whenever [throttle valve-opening], fuel oil consumption, etc., and is the motor torque TM. It asks from a motor current etc. At step S2, it judges whether the internal combustion engine (ICE) 12 is out of order from data, such as it, and judges whether the electric motor 14 is out of order in step S3. It is the above-mentioned engine torque TE called for, for example from whenever [throttle valve-opening] etc. about failure of an internal combustion engine 12. Actual engine speed Ne It is the above-mentioned motor torque TM which can judge from relation etc. and is searched for, for example from a motor current etc. about failure of an electric motor 14. Actual motor rotational frequency nickel, i.e., an input rotational frequency, It can judge from relation etc. And at the time of failure of an internal combustion engine 12, ICE fail control of step S6 is performed, motor fail control of step S4 is performed at the time of failure of an electric motor 14, and all, an internal combustion engine 12 and an electric motor 14 always [of step S5 / forward] perform control, in being normal.

[0033] Drawing 3 is always [of the above-mentioned step S5 / forward] an example of control, and computes the power requirement PL required for transit of a car using operation expression, a data map, etc. which were memorized beforehand from accelerator control input thetaAC, the change rate, the vehicle speed V, etc. in step S5-1. Step S Although it judges whether it is more than the amount A of the minimum accumulation of electricity as which the amount SOC of accumulation of electricity was determined beforehand, and less than [step S5-3] will be performed in 5-2 if it is SOC>=A, in SOC<A, the generation-of-electrical-energy mode subroutine of step S5-8 is performed. When the amount A of the minimum accumulation of electricity runs an electric motor 14 as a driving source, taking out electrical energy from accumulation-of-electricity equipment 36 is the minimum amount of accumulation of electricity permitted, and about 70% of value is set up based on discharge effectiveness, charging efficiency, etc. of accumulation-of-electricity equipment 36. And in the generation-of-electrical-energy mode subroutine of step S5-8 which are performed in SOC<A, while operating an internal combustion engine 12 above the output corresponding to a power requirement PL and making it run a car with a power requirement PL, carry out a rotation drive, an electric motor 14 is made to generate with an excessive output, and accumulation-of-electricity equipment 36 is charged. The output control of the internal combustion engine 12 in this case, i.e., control of an engine torque or a rotational frequency, and generation-of-electrical-energy control of an electric motor 14 are performed in consideration of a change gear ratio of a change gear 16, power loss, etc. in the gear change control of forward always performed by step S5-9.

[0034] In step S5-3 which are performed in SOC>=A, it judges whether a power requirement PL is larger than the 1st boundary value B defined beforehand, and if it is PL>B, it will judge whether it is larger than the 2nd larger boundary value C than the 1st boundary value B at step S5-4. And if it is PL<=B, the motor drive subroutine of step S5-7 will be performed, if it is B<PL<=C, the ICE drive subroutine of step S5-6 will be performed, and if it is PL>C, ICE and the motor drive subroutine of step S5-5 will be performed. Step S In the motor drive subroutine of 5-7, it runs only using an electric motor 14, and it runs only using an internal combustion engine 12, and runs at the ICE drive subroutine of step S5-6 using both an internal combustion engine 12 and the electric motor 14 by ICE and the motor drive subroutine. The output control of an internal combustion engine 12 and an electric motor 14 is performed in consideration of a change gear ratio of a change gear 16, power loss, etc. in the gear

change control of forward always to which it is carried out by step S5-9 in any case. Step S An electric motor 14 is made into unloaded condition in the ICE drive subroutine of 5-6, and a clutch 30 is intercepted in the motor drive subroutine of step S5-7.

[0035] Here the 1st boundary value B of the above, and the 2nd boundary value C For example, the driving torque and the vehicle speed V of a car which are operational status as shown in drawing 6 are made into a parameter. Can express for every gear ratio of said change gear 16, and the motor drive subroutine of step S5-7 is performed from the 1st boundary value B in the field by the side of low loading O, i.e., a zero. In the field between the 1st boundary value B and the 2nd boundary value C, the ICE drive subroutine of step S5-6 is performed, and ICE and the motor drive subroutine of step S5-5 are performed in the field by the side of a heavy load from the 2nd boundary value C. That is, the field by the side of low loading is equivalent to the motor driver zone it runs only using a motor from the 1st boundary value B, and the field by the side of a heavy load is equivalent to the engine drive field it runs using an engine from the 1st boundary value B. This 1st boundary value B is set up based on an internal combustion engine's 12 specific fuel consumption (fuel consumption per unit power) and rate of an exhaust gas (amount of exhaust gases per unit power), the energy conversion efficiency of an electric motor 14, etc. so that fuel consumption and the amount of exhaust gases may decrease as much as possible.

[0036] In step S5-9 of the last, change-over control of the gear ratio of said change gear 16 is carried out according to the gear change map (gear change conditions) beforehand set up considering accelerator control input thetaAC and the vehicle speed V which are operational status as a continuous line shows, for example to drawing 7 as a parameter. drawing 7 -- the case of four steps of advance -- i1 -i4 respectively -- a change gear ratio (=nickel / No) -- expressing -- **** -- the magnitude -- i1 >i2 >i3 >i4 it is . In addition, B and C which are shown in drawing 7 with an alternate long and short dash line correspond to said 1st boundary value B and the 2nd boundary value C, and it is run only with an electric motor 14 below the alternate long and short dash line B, is run only with an internal combustion engine 12 between alternate long and short dash lines B and C, and is run by the top [alternate long and short dash line / C] using both an electric motor 14 and the internal combustion engine 12.

[0037] Drawing 4 is an example of ICE fail control of said step S6, and computes a power requirement PL like said step S5-1 in step S6-1. Step S It judges whether it is below the failure time limit constant value D with a larger power requirement PL defined beforehand than said 1st boundary value B, and if it is PL<=D, in step S6-3, actuation of an electric motor 14 will be controlled by 6-2 so that a car is run with a power requirement PL. In PL>D, transit impossible diagnosis is generated in step S6-4, and in step S6-5, actuation of an electric motor 14 is controlled so that a car is run with the failure time limit constant value D, while performing a vision display or a phonological representation of a purport etc. which cannot raise an output any more. Namely, the output limitation by the side of the heavy load of the electric motor [in / as shown in drawing 6 / always / forward] 14 (the 1st boundary value B) It expanded from the 1st boundary value B to the failure time limit constant value D by the side of a heavy load. The part which performs the above-mentioned step S6-2, S6-3, and S6-5 among a series of signal processing by the controller 28 is equivalent to the motor-output limited modification means of claim 3 which is one embodiment of the driver zone modification means of claim 1. This failure time limit constant value D is set up so that it may be satisfied with the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination of the predetermined minimum service conditions -- the predetermined vehicle speed Y (km/h) being obtained or predetermined acceleration Z (G) being obtained at the time of the start under predetermined transit conditions. Moreover, ICE fail control of this drawing 4 , i.e., the part which performs step S6 of said drawing 2 , is equivalent to a drive control means at the time of failure of claim 1.

[0038] In step S6-6 of the last, gear change control of a change gear 16 is performed according to the gear change map at the time of an ICE fail. When a gear change map makes only an electric motor 14 a driving source at the time of this ICE fail and it runs under the power below the above-mentioned failure time limit constant value D, it is determined that gear change control suitable in the field below the broken line D in the inside of the field of accelerator control input thetaAC from which the output of that

electric motor 14 specifically changes, i.e., drawing 7 , is performed, and storage means, such as RAM, memorize beforehand so that suitable gear change control may be performed. The broken line D of drawing 7 corresponds to the failure time limit constant value D. In addition, what is necessary is it to be also possible at the time of an ICE fail for to amend the map which asks for a power requirement PL, operation expression, etc., and just to also set gear change control of a change gear 16 to it in 0 - 100% of range in that case so that the power requirement PL required for transit of a car may serve as the failure time limit constant value D when alkali-cellulose control input thetaAC is 100%. The part which performs step S6-6 among a series of signal processing by the controller 28 is equivalent to a gear change control means at the time of failure of claim 5, and the part which performs step S6 of ICE fail control of drawing 4 , i.e., drawing 2 , is equivalent to a drive control means at the time of failure of claim 5.

[0039] A gear change map a gear change line so that it can run also for example, a climb way certainly and may become a low gear from the case of the gear change map of forward always at the time of the above-mentioned ICE fail A high vehicle speed side, The vehicle speed Y predetermined in changing into the right-hand side in drawing 7 **** in the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination (km/h) is obtained, Or the thing acquired for predetermined acceleration Z (G) at the time of the start under predetermined transit conditions, It enables it to perform gear change control, or various modes -- gear change control is made to be performed so that the predetermined minimum service condition may be satisfied and the consumption of the electrical energy by the electric motor 14 may decrease as much as possible -- can be adopted. In order to make it the consumption of the electrical energy by the electric motor 14 decrease Power transmission-efficiency etaT of a change gear 16 And energy-conversion-efficiency etaM of an electric motor 14 It uses. The dc-battery consumption EBOUT is calculated according to a degree type (1), changing the gear ratio of a change gear 16. The part which performs step S6-6 in that case functions as an energy-saving gear change control means of claim 6 that what is necessary is just to set up a gear change map so that it may run for the gear ratio from which the dc-battery consumption EBOUT serves as min. In addition, power transmission-efficiency etaT of a change gear 16 A gear ratio, transfer torque, etc. are searched for as a parameter, and it is energy-conversion-efficiency etaM of an electric motor 14. Motor torque and a motor rotational frequency are called for as a parameter.

EBOUT=PL/(etaT xetaM) ... (1)

[0040] Here, in ICE fail control of this drawing 4 , since the output limitation by the side of the heavy load of an electric motor 14 (the 1st boundary value B) is expanded from it to the failure time limit constant value D by the side of a heavy load, it becomes possible to perform heavy load transit of a climb way etc. by making only an electric motor 14 into a driving source. Moreover, since change-over control of the gear ratio is carried out according to the gear change map at the time of the engine failure set that suitable gear change control is performed when running by making only an electric motor 14 into a driving source under the power below the above-mentioned failure time limit constant value D, a change gear 16 can reduce the amount of electrical energy consumption by the electric motor 14, securing predetermined performance-traverse ability. That is, while performance-traverse ability is raised by such an output control of an electric motor 14 and gear change control of a change gear 16, reducing the amount of electrical energy consumption and the transit under the transit conditions which were conventionally impossible for transit is attained, with the electrical energy with which accumulation-of-electricity equipment 36 was restricted, sufficient mileage can be secured now and it can run to the predetermined destination. In addition, although charge is performed to accumulation-of-electricity equipment 36 also in the time of such an ICE fail by regenerative braking at the time of brakes operation etc., since said step S5-8 which charge with an internal combustion engine 12 become impossible, charges run short compared with always [forward].

[0041] Moreover, a gear change map is power transmission-efficiency etaT of a change gear 16 at the time of the above-mentioned engine failure. And energy-conversion-efficiency etaM of an electric motor 14 It takes into consideration, and when being set up so that the consumption of the electrical energy by the electric motor 14 may serve as min, and gear change control may be performed, the consumption of

electrical energy is reduced further and the long-distance transit of it is attained.
[0042] Moreover, in this ICE fail control, since the transit using an electric motor 14 is continued even if the amount SOC of accumulation of electricity does not change drive control like control by whether it is more than the amount A of the minimum accumulation of electricity at the time of normal of drawing 3 and the amount SOC of accumulation of electricity is less than the amount A of the minimum accumulation of electricity, the mileage it can run with an electric motor 14 can fully be secured, and it can run to the predetermined destination. That is, ICE fail control of step S6 without the limit by the amount SOC of accumulation of electricity is functioning also as an amount modification means of the minimum accumulation of electricity of claim 7.
[0043] In addition, although the upper example explained the case where the output limitation by the side of the heavy load of an electric motor 14 (the 1st boundary value B) was expanded to the failure time limit constant value D by the side of a heavy load It can also be possible to reduce the output limitation (the 1st boundary value B) to a low loading side like the broken line E of drawing 6 , the consumption of the electrical energy by the electric motor 14 can be reduced in that case, and mileage sufficient with the electrical energy with which accumulation-of-electricity equipment 36 was restricted can be secured now. Such an embodiment is equivalent to one example of claim 4.
[0044] On the other hand, drawing 5 is an example of motor fail control of said step S4, and computes a power requirement PL like said step S5-1 in step S4 -1. It judges whether it is beyond the failure time limit constant value E with a power requirement PL smaller than said 1st boundary value B defined beforehand, and if it is PL>=E, in step S4 -3, an internal combustion engine's 12 actuation will be controlled by step S4 -2 so that a car is run with a power requirement PL. In PL<E, transit impossible diagnosis is generated in step S4 -4, and in step S4 -5, an internal combustion engine's 12 actuation is controlled so that a car is run with the failure time limit constant value E, while performing a vision display or a phonological representation of a purport etc. which cannot lower an output any more. Namely, the output limitation by the side of the internal combustion engine's [in / as shown in drawing 6 / always / forward] 12 low loading (the 1st boundary value B) It expanded and carried out from the 1st boundary value B to the failure time limit constant value E by the side of low loading. The part which performs above-mentioned step S4 -2, S4 -3, and S4 -5 among a series of signal processing by the controller 28 is equivalent to the engine power limited modification means of claim 2 which is one embodiment of the driver zone modification means of claim 1. It is determined that the low-speed transit which departs from it and stops a car smoothly is possible for this failure time limit constant value E. Moreover, the part which performs motor fail control of this drawing 5 , i.e., step S4 of said drawing 2 , is equivalent to a drive control means at the time of failure.
[0045] In last step S4 -6, gear change control of a change gear 16 is performed according to the gear change map at the time of a motor fail. when a gear change map make only an internal combustion engine 12 a driving source at the time of this motor fail and it run under the power beyond the above-mentioned failure time limit constant value E , it be determine that it run for the gear ratio from which it be a field more than the broken line E in the inside of the field of accelerator control input thetaAC from which that internal combustion engine 12 output specifically change , i.e. , drawing 7 , for example , fuel consumption serve as min , and it be beforehand memorize by storage means , such as RAM , so that suitable gear change control may be perform . The broken line E of drawing 7 corresponds to the failure time limit constant value E. In addition, what is necessary is it to be also possible at the time of a motor fail for to amend the map which asks for a power requirement PL, operation expression, etc., and just to also set gear change control of a change gear 16 to it in 0 - 100% of range in that case so that the power requirement PL required for transit of a car may serve as the failure time limit constant value E when alkali-cellulose control input thetaAC is 0%. The part which performs step S4 -6 among a series of signal processing by the controller 28 is equivalent to a gear change control means at the time of failure of claim 5, and the part which performs motor fail control of drawing 5 , i.e., step S4 of drawing 2 , is equivalent to a drive control means at the time of failure of claim 5.
[0046] Here, in motor fail control of this drawing 5 , since the output limitation by the side of an internal combustion engine's 12 low loading (the 1st boundary value B) is expanded from it to the failure time

limit constant value E by the side of low loading, it becomes possible to perform low-speed transit at the time of start and a halt etc. good by making only an internal combustion engine 12 into a driving source. Moreover, since change-over control of the gear ratio is carried out according to the gear change map at the time of the motor failure set that suitable gear change control is performed when running only an internal combustion engine under the power beyond the above-mentioned failure time limit constant value E, using only an internal combustion engine 12 as a driving source, a change gear 16 can reduce the fuel consumption by the internal combustion engine 12, securing predetermined performance-traverse ability. Namely, performance-traverse ability is raised by such an internal combustion engine's 12 output control and gear change control of a change gear 16, reducing fuel consumption, the transit under the transit conditions which were conventionally impossible for transit is attained, and it can run now to the predetermined destination.

[0047] Thus, according to the hybrid driving gear 10 of this example, even if either the internal combustion engine 12 which is a driving source, and the electric motor 14 break down, it is run good using the driving source of another side, and can run to the predetermined destination.

[0048] Next, other examples of this invention are explained. In addition, the same sign is given to the part which is substantially common in said example in the following examples, and detailed explanation is omitted.

[0049] Drawing 8 is a block diagram explaining the outline configuration of the hybrid driving gear 50 of a series mold, it has the generator 52 which generates electrical energy by carrying out a rotation drive by the internal combustion engine 12, and an electric motor 14 runs only the electric motor 14 as a driving source while being operated by the electrical energy accumulated in the electrical energy and/or the accumulation-of-electricity equipment 36 which were taken out with the generator 52. Drawing 9 is a basic flow chart explaining actuation of this hybrid driving gear 50. At step R1, accelerator control input thetaAC, an engine speed Ne, and the input rotational frequency (motor rotational frequency) nickel the output engine speed No, the amount SOC of accumulation of electricity, an engine torque TE, and motor torque TM Data are read. etc. -- If all are normal, while judging whether the internal combustion engine (ICE) 12 or the generator 52 is out of order from data, such as it, at step R2, and always [of step R3 / forward] performing control, when either is also out of order, control is performed at the time of the fail of step R4. It is the engine torque TE called for, for example from whenever [throttle valve-opening] etc. about failure of an internal combustion engine 12. Actual engine speed Ne It can judge from relation etc. and failure of a generator 52 can be judged from the relation of the engine speed Ne and generating current value which are the engine speed of a generator 52 etc.

[0050] Although drawing 10 is always [of the above-mentioned step R3 / forward] an example of control, and the power requirement PL required for transit of a car is computed like said example, and it judges whether it is more than the amount A of the minimum accumulation of electricity as which the amount SOC of accumulation of electricity was beforehand determined in step R3-2, and less than [step R3-3] will be performed in step R3-1 if it is SOC>=A, as for the case of SOC<A, the charge mode subroutine of step R3-6 is performed. In this charge mode subroutine, while operating an electric motor 14 so that it may be made to run a car with a power requirement PL, an internal combustion engine 12 is operated so that a generator 52 may generate much electrical energy from electrical energy required for actuation of that electric motor 14, and excessive electrical energy is charged at accumulation-of-electricity equipment 36. The output of an electric motor 14 is controlled in consideration of the change gear ratio of the change gear 16 in the gear change control of forward always performed by step R3-7.

[0051] In step R3-3 which are performed in SOC>=A, it judges whether a power requirement PL is larger than the boundary value F defined beforehand, if it is PL>F, the ICE actuation motor drive subroutine of step R3-4 will be performed, and if it is PL<=F, the ICE halt motor drive subroutine of step R3-5 will be performed. Step R An electric motor 14 is operated so that it may be made to run a car with a power requirement PL, and in the ICE actuation motor drive subroutine of 3-4, operating an internal combustion engine 12 and generating electrical energy with a generator 52, if there are more amounts of electrical energy generated with a generator 52 than the amount of consumption electrical energy of an electric motor 14, the excessive electrical energy is charged by accumulation-of-electricity

equipment 36, and when fewer than the amount of consumption electrical energy, only an insufficiency will be taken out from charging equipment 36. Moreover, in the ICE halt motor drive subroutine of step R3-5, while suspending an internal combustion engine 12, an electric motor 14 is operated so that it may be made to run a car with a power requirement PL. Boundary value F can be expressed for every gear ratio of said change gear 16 by making into a parameter the driving torque and the vehicle speed V of a car which are operational status, as shown in drawing 12 , in the field by the side of low loading O, i.e., a zero, the ICE halt motor drive subroutine of step R3-5 is performed from boundary value F, and the ICE actuation motor drive subroutine of step R3-4 is performed in the field by the side of a heavy load from boundary value F. The output of an electric motor 14 is controlled in consideration of the change gear ratio of the change gear 16 in the gear change control of forward always to which it is carried out by step R3-7 in any case.

[0052] In step R3-7 of the last, change-over control of the gear ratio of said change gear 16 is carried out according to the gear change map (gear change conditions) beforehand set up like said example considering accelerator control input thetaAC and the vehicle speed V as a parameter.

[0053] Drawing 11 is an example of fail control of said step R4, and computes a power requirement PL like said example in step R4-1. Step R It judges whether it is below the failure time limit constant value G with a larger power requirement PL defined beforehand than said boundary value F, and if it is PL<=G, in step R4-3, actuation of an electric motor 14 will be controlled by 4-2 so that a car is run with a power requirement PL. In PL>G, transit impossible diagnosis is generated in step R4-4, and in step R4-5, actuation of an electric motor 14 is controlled so that a car is run with the failure time limit constant value G, while performing a vision display or a phonological representation of a purport etc. which cannot raise an output any more. In control of this etc., all electrical energy required for actuation of an electric motor 14 is taken out from accumulation-of-electricity equipment 36. The field below the failure time limit constant value G to which transit control is carried out at the time of this fail is equivalent to a driver zone at the time of failure of claim 8, and the part which performs fail control R4 of drawing 11 , i.e., the step of said drawing 9 , is equivalent to a motorised control means at the time of failure of claim 8. In addition, the above-mentioned failure time limit constant value G is set up so that it may be satisfied with the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination of the predetermined minimum service conditions -- the predetermined vehicle speed Y (km/h) being obtained or predetermined acceleration Z (G) being obtained at the time of the start under predetermined transit conditions.

[0054] In step R4-6 of the last, gear change control of a change gear 16 is performed according to the gear change map at the time of a fail. At the time of this fail, when running by making an electric motor 14 into a driving source under the power below the above-mentioned failure time limit constant value G, gear change control is performed like step S6-6 in said example so that suitable gear change control may be performed. In that case, when being set up so that it may run for the gear ratio from which the dc-battery consumption EBOUT asked for a gear change map by the aforementioned (1) formula serves as min at the time of a fail, the part which performs step R4-6 functions as an energy-saving gear change control means of claim 6.

[0055] Thus, since according to the hybrid driving gear 50 of this example a car is run by the electric motor 14 in the low loading field below the failure time limit constant value G when an internal combustion engine 12 or a generator 52 breaks down, even if the consumption of the electrical energy by the electric motor 14 is reduced, the generation of electrical energy with a generator 52 serves as impossible and supply of electrical energy is intercepted, mileage sufficient with the electrical energy with which accumulation-of-electricity equipment 36 was restricted is securable. Moreover, since it is controlled to take out all electrical energy required for actuation of an electric motor 14 from accumulation-of-electricity equipment 14, it is avoided that running becomes impossible insufficient [supply of the electrical energy to an electric motor 14] therefore. Thereby, even if electrical energy is no longer charged by accumulation-of-electricity equipment 36 by failure of an internal combustion engine 12 or a generator 52, it can reach to the predetermined destination. In addition, although control which charges the electrical energy which this example also made carry out regenerative braking of the

electric motor 14 at the time of brakes operation etc., and generated it at accumulation-of-electricity equipment 36 is performed, since charge by the internal combustion engine 12 becomes impossible, charges run short compared with always [forward].

[0056] Moreover, the gear change map at the time of a fail is power transmission-efficiency etaT of a change gear 16. And energy-conversion-efficiency etaM of an electric motor 14 It takes into consideration, and when being set up so that the consumption of the electrical energy by the electric motor 14 may serve as min, and gear change control may be performed, the consumption of electrical energy is reduced further and the long-distance transit of it is attained.

[0057] Moreover, the mileage it can run with an electric motor 14 since transit according [even if the amount SOC of accumulation of electricity does not change drive control like control in fail control of this example by whether it is more than the amount A of the minimum accumulation of electricity at the time of normal of drawing 10 and the amount SOC of accumulation of electricity is less than the amount A of the minimum accumulation of electricity, take out all electrical energy from accumulation-of-electricity equipment 36, and] to an electric motor 14 is continued can fully be secured, and it can run now to the predetermined destination. That is, fail control of step R4 without the limit by the amount SOC of accumulation of electricity is functioning also as an amount modification means of the minimum accumulation of electricity of claim 7.

[0058] As mentioned above, although the example of this invention was explained to the detail based on the drawing, this invention can also be carried out in other modes.

[0059] For example, although the change gear 16 of said example was equipped with the pre-go-astern change-over device, it is also possible to switch the hand of cut of an electric motor 14, and to make it move forward and retreat a car.

[0060] moreover, although the clutch 30 was formed between the internal combustion engine 12 and the change gear 16 in the example of said drawing 1 , it is possible to arrange a clutch also between a change gear 16 and an electric motor 14 -- etc. -- arrangement gestalten, such as a clutch, may be changed suitably.

[0061] Moreover, this invention may be similarly applied to the hybrid driving gear which compounds the output of an internal combustion engine 12 and an electric motor 14 with an epicyclic gear drive, and is transmitted to a change gear 16 side.

[0062] In addition, although instantiation is not carried out one by one, this invention can be carried out in the mode which added various modification and amelioration based on this contractor's knowledge.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the hybrid driving gear which has an engine and a motor, and especially, with a parallel mold, when either an engine and a motor break down, when an engine or a generator breaks down, it relates to the technique it enables it to run to the predetermined destination, respectively in a series mold.

[Translation done.]

* NOTICES *

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PRIOR ART

[Description of the Prior Art]
(a) The engine which operates by combustion of a fuel, and (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) While having the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates and using the engine and motor as a driving source at the time of car transit The so-called parallel type with which the engine drive field by the side of the heavy load it runs using the motor driver zone and engine by the side of the low loading it runs only using a motor according to operational status was appointed beforehand of hybrid driving gear is indicated by JP,5-50865,A. Moreover, (a) The engine which operates by combustion of a fuel, and (b) The generator which generates electrical energy by carrying out a rotation drive with the engine, (c) Accumulation-of-electricity equipment which accumulates the electrical energy taken out with the generator, (d) It has the motor which operates with the electrical energy accumulated in the electrical energy taken out with said generator, and/or said accumulation-of-electricity equipment, and the so-called series type using the motor as a driving source at the time of car transit of hybrid driving gear is also proposed. In addition, the so-called parallel series mold which enabled it to use the engine in what [what combined the parallel mold with this series mold], i.e., the above-mentioned series mold hybrid driving gear, as a driving source apart from a motor is also proposed.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] When the hybrid driving gear of the 1st invention of the above is a parallel mold and either a motor or an engine breaks down While running using the driving source of another side by the drive control means at the time of failure Since the driver zone by the driving source of the another side is changed into the field which differs from always [forward] with a driver zone modification means, the transit of it under the transit conditions which were impossible for the conventional transit can be attained, or it can secure sufficient mileage, and can run mileage to the predetermined destination.
[0015] For example, it becomes possible to perform low loading transit at the time of start and a halt etc. by making an engine into a driving source by expanding the output limitation by the side of the low loading of the engine set up like the 2nd invention corresponding to the engine drive field to a low loading side at the time of failure of a motor. By expanding the output limitation by the side of the heavy load of the motor set up like the 3rd invention corresponding to the motor driver zone to a heavy load side at the time of failure of an engine By becoming possible to perform heavy load transit of a climb way etc. by making a motor into a driving source, and reducing the output limitation by the side of the heavy load of the motor set up like the 4th invention corresponding to the motor driver zone to a low loading side The consumption of the electrical energy by the motor is reduced and mileage sufficient with the electrical energy with which accumulation-of-electricity equipment was restricted can be secured now.
[0016] When the hybrid driving gear of the 5th invention is a parallel mold and either a motor or an engine breaks down While running using the driving source of another side by the drive control means at the time of failure Since the relation between operational status and a change gear ratio is changed by the gear change control means at the time of failure at the time of the failure, When running only by the driving source of another side, suitable gear change control is able to be made to be performed in respect of the consumption of electrical energy, performance-traverse ability, etc. The transit under the transit conditions which were conventionally impossible for transit can be attained, or sufficient mileage can be secured, and it can run now to the predetermined destination.
[0017] Mileage sufficient with the electrical energy with which the consumption of the electrical energy according to a motor since the change gear ratio of a change gear is determined that the amount of electrical energy which a motor consumes by the energy-saving gear change control means when, as for the hybrid driving gear of the 6th invention, neither of a parallel mold and series mold interferes and an engine breaks down will become small was reduced, and accumulation-of-electricity equipment was restricted can be secured now, and it can run now to the predetermined destination.
[0018] Since the amount of the accumulation-of-electricity equipment with which taking out electrical energy from accumulation-of-electricity equipment in order to operate a motor is permitted of the minimum accumulation of electricity is lowered by the amount modification means of the minimum accumulation of electricity when neither a parallel mold nor a series mold interfere and an engine breaks down, the hybrid driving gear of the 7th invention becomes possible [taking out so much electrical energy from accumulation-of-electricity equipment], can fully secure the mileage it can run with a

motor, and can run mileage to the predetermined destination.
[0019] The hybrid driving gear of the 8th invention is a series mold, and since a car is run by the motor in the range of a driver zone at the time of the failure by the side of low loading when an engine or a generator breaks down, even if the consumption of the electrical energy by the motor is reduced and supply of the electrical energy from a generator is intercepted, it can secure mileage sufficient with the electrical energy with which accumulation-of-electricity equipment was restricted. Moreover, since it is controlled to take out all electrical energy required for actuation of a motor from accumulation-of-electricity equipment, it is avoided that running becomes impossible insufficient [supply of the electrical energy to a motor] therefore. Thereby, even when electrical energy is no longer charged by accumulation-of-electricity equipment by failure of an engine or a generator, it can reach to the predetermined destination.
[0020]
[Embodiment of the Invention] Here, the engine drive field in the hybrid driving gear of the 1st invention should just be a field which the thing which runs as a driving source both the thing which runs only an engine as a driving source or an engine, and a motor may also consist of the field of the both, and runs also a thing using an engine at least. By arranging a generator separately from a motor, for example, using said motor as a generator, and carrying out the rotation drive of the generator with regenerative braking and the engine of a car, accumulation-of-electricity equipment is constituted so that it can charge if needed. Although actuation of the motor in a motor driver zone takes out all required electrical energy from accumulation-of-electricity equipment, it may use the electrical energy generated by carrying out the rotation drive of the generator with an engine. Even if motors including other invention are arranged by two or more driving wheels, respectively, you may be constituted so that the rotation drive of two or more driving wheels may be carried out with a single motor, but when it has the change gear which can change a change gear ratio, it is desirable to constitute so that the rotation drive of two or more driving wheels with a single motor may be carried out.
[0021] Although the motor driver zone and engine drive field which are appointed according to operational status are set up considering driving torque, the vehicle speed, etc. as a parameter with a power requirement required for transit of a car, even if this is defined by limiting the output area of a motor and an engine and sets up a motor driver zone and engine drive fields, such as this, in the output area of the motor which is a driving source, and an engine so that fuel consumption and the amount of exhaust gases may decrease as much as possible, it does not interfere. Although a driver zone modification means changes output limitation of a motor or an engine like the 2nd invention - the 4th invention, when it has the change gear which can change a change gear ratio, it may change a driver zone into a high torque low vehicle speed or low torque quantity vehicle speed side by changing the change gear ratio. Generally the capacity of the motor to be used is defined in consideration of the generation of electrical energy at the time of regenerative braking, and since it is an output area lower enough than the maximum output, even if a motor driver zone, i.e., the limited output area of a motor, expands the output limitation by the side of the heavy load of a motor to a heavy load side like the 3rd invention, it can operate a motor continuously.
[0022] Moreover, although there are two kinds, the case where it uses and runs an engine on the occasion of implementation of the 1st invention at the time of failure of a motor, and when using and running a motor at the time of failure of an engine, what has one of the functions may have both functions. The same is said of the 5th invention.
[0023] Although modification of the output limitation in the 2nd invention - the 4th invention may be beforehand memorized in the form of a data map etc. as a limited output area at the time of failure, it can adopt various modification gestalten, such as what adds a predetermined value to the output limited value of forward always, subtracts, or multiplies by it and changes a predetermined rate. When a motor breaks down, it is determined that the low-speed transit which the output limitation by the side of engine low loading is expanded to a low loading side, and stops [stop and it departs / transit] a car smoothly is possible, but the driver zone modification means of the 2nd invention is included in this invention, also when losing the limitation by the side of low loading. Although the driver zone modification means of

the 3rd invention expands the output limitation by the side of the heavy load of a motor to a heavy load side when an engine breaks down On the occasion of modification of the output limitation by the side of this heavy load, the predetermined vehicle speed Y (km/h) is obtained, for example under the transit conditions predetermined [, such as X etc. degrees,] in inclination, Or things set up so that the predetermined minimum service condition may be satisfied -- predetermined acceleration Z (G) is obtained at the time of the start under predetermined transit conditions -- are desirable. In addition, although the output limitation by the side of low loading, i.e., low-power output, and the output limitation by the side of a heavy load, i.e., high power, are changed in the 2nd invention - the 4th invention, like the case where a change gear ratio is changed on the occasion of implementation of the 1st invention, the magnitude of the output of an engine or a motor itself is the same, and it is also possible to change an output area into a high vehicle speed low torque and/or low vehicle speed quantity torque side.

[0024] The change gear of the 5th invention and the 6th invention may be a nonstep variable speed gear from which a change gear ratio changes continuously, even if a change gear ratio is the owner stage change gear which changes gradually. In the case of an owner stage change gear, it is set up on the gear change map which makes a parameter for example, an accelerator control input, the vehicle speed, etc., the relation, i.e., the gear change conditions, of the operational status and the change gear ratio in the 5th invention, and, in the case of a nonstep variable speed gear, it is determined that the operation expression which makes a parameter the accelerator control input, vehicle speed, etc. determines a change gear ratio. And at the time of failure, when running only by the driving source of another side, a gear change control means is set that suitable gear change control is performed in the field of the accelerator control input from which the output specifically changes so that suitable gear change control may be performed, for example, so that suitable gear change control may be performed in the output area of the driving source of another side. Namely, the hybrid driving gear of a parallel mold Operational status is embraced. An accelerator control input below a predetermined value A motor driver zone, Beyond a predetermined value is determined as an engine drive field etc., and at the time of an engine failure, when output limitation of a motor is changed like the 3rd invention or the 4th invention beyond a predetermined value, an accelerator control input Above the new predetermined value accompanying the modification, in order not to stick and change to the maximum of the limited output area of a motor, suitable gear change control is made to be performed in the field of the accelerator control input from which an output changes. It is also the same as when running with an engine at the time of failure of a motor. In addition, what is necessary is it to be also possible for to amend the map which asks for a power requirement required for transit of a car, operation expression, etc., and just to also set up gear change control of a change gear in 0 - 100% of range in that case so that it may become the minimum value of an engine limited output area when an accelerator control input is 0% at the time of motor failure so that it may become the maximum of the limited output area of a motor, when an alkali-cellulose control input is 100% at the time of an engine failure.

[0025] Moreover, since high power is not obtained at the time of the above-mentioned failure when an engine breaks down and a gear change control means runs only with a motor, For example, the thing acquired for the vehicle speed Y predetermined in changing a change gear ratio and gear change conditions **** in the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination (km/h) so that it can run also a climb way certainly and may become a low gear from the case of the usual gear change conditions, Or the thing acquired for predetermined acceleration Z (G) at the time of the start under predetermined transit conditions, It enables it to perform gear change control, or various modes -- gear change control is made to be performed so that the predetermined minimum service condition may be satisfied and the consumption of the electrical energy by the motor may become small like the 6th invention -- can be adopted. Moreover, at the time of failure of a motor, a change gear ratio and gear change conditions are changed, or even if an engine is operated in the engine drive field for example, by the side of a heavy load, it is constituted so that fuel consumption effectiveness or exhaust-gas effectiveness with an engine may become high and gear change control may be performed, so that it may become a low gear from the case where they are the usual gear change

conditions, so that the low-speed transit at the time of start and a halt etc. may be possible. At the time of this failure, although the gear change control means may also memorize beforehand the relation between the gear change conditions at the time of failure, i.e., operational status, and a change gear ratio in the form of a data map etc., it can adopt various modification gestalten, such as what adds a predetermined value to the gear change conditions of forward always, subtracts, or multiplies by it and changes a predetermined rate. Moreover, it combines with modification of output limitation of the engine of the 2nd invention - the 4th invention, or a motor, and this 5th invention can be carried out.
[0026] When an engine breaks down, the energy-saving gear change control means of the 6th invention is constituted so that the amount of electrical energy which a motor consumes may become small, and it may become min desirably, and the change gear ratio of the change gear may be controlled in consideration of either [at least] the power transmission efficiency of a change gear, or the energy conversion efficiency of a motor. Like the 5th invention of the above, when carrying out gear change control according to operational status, in consideration of either [at least] the power transmission efficiency of a change gear, or the energy conversion efficiency of a motor, gear change control can also be performed according to a gear change map etc. at the time of the failure beforehand set up so that the consumption of electrical energy might become small. It combines with the 1st invention - the 5th invention, and this 6th invention can be carried out. Moreover, although the hybrid driving gear of the 6th invention does not interfere with a parallel mold or a series mold, either, it is desirable that it is made to perform the above gear change control in the hybrid driving gear of a series mold not only at an engine but at the time of failure of a generator.
[0027] In order to operate a motor at the time of failure of an engine, taking out electrical energy from accumulation-of-electricity equipment lowers the amount of the minimum accumulation of electricity permitted, but the amount modification means of the minimum accumulation of electricity of the 7th invention is included in this invention, also when losing the limit about the amount of the minimum accumulation of electricity. If taking out electrical energy is permitted even if accumulation-of-electricity equipment becomes about 70% or less which is the amount of the minimum accumulation of electricity at the time of an engine failure, since it is generally used in consideration of an energy conversion efficiency, a life, etc. in 70% - about 80% of accumulation-of-electricity range, mileage will be extended sharply. It combines with the 1st invention - the 6th invention, and this 7th invention can be carried out. Moreover, the hybrid driving gear of this 7th invention does not interfere with a parallel mold or a series mold, and also when not only an engine but a generator breaks down at the hybrid driving gear of a series mold, it is desirable to make it lower the amount of the minimum accumulation of electricity of accumulation-of-electricity equipment.
[0028] Although the rotation drive of the generator is carried out with an engine in all the driver zones that are series molds and run a motor as a driving source and the hybrid driving gear of the 8th invention generates electrical energy for example, operational status in the driver zone of the low loading set up beforehand While suspending an engine and taking out all electrical energy required for a motor from said accumulation-of-electricity equipment An engine is operated from it in the driver zone of a heavy load, and when the electrical energy remained and it is [it charges and] insufficient for accumulation-of-electricity equipment, you may make it take out from accumulation-of-electricity equipment, while a motor is operated using the electrical energy taken out with the generator. Moreover, only a motor needs to be used as a driving source in no driver zones, and it is also possible to constitute so that only an engine can use an engine and a motor as a driving source in a predetermined driver zone. It combines with the 6th invention or the 7th invention, and this 8th invention can be carried out. In addition, when it has a change gear, it is desirable to establish a gear change control means at the time of the same failure as the 5th invention so that gear change control suitable also at the time of the failure to which the operating space of an electric motor is limited to a low loading side may be performed.
[0029] Hereafter, the example of this invention is explained to a detail based on a drawing. Drawing 1 is a block diagram explaining the configuration of the hybrid driving gear 10 of a parallel mold, mechanical joint relation is shown by the thick continuous line, and electric joint relation is shown by the thin line. This hybrid driving gear 10 is equipped with the internal combustion engines 12, such as a

gasoline engine which operates by combustion of a fuel, and the electric motor 14 as a motor which operates with electrical energy as a driving source, and the power of the internal combustion engines 12, such as it, and an electric motor 14 is transmitted to a change gear 16 that it is simultaneous or alternatively, and is further transmitted to the driving wheel 20 on either side through a reducer 18, the differential machine which is not illustrated. The change gear 16 has the owner stage change gear style which forms advance (FWD), go-astern (REV), and two or more advance gear ratios from which the pre-go-astern change-over device which switches a neutral (N), and a change gear ratio differ, and when a shift lever 22 is operated by the operator, advance, go-astern, and a neutral are switched by the change actuator 24. Moreover, the signal showing the shift position of a shift lever 22 is supplied to a controller 28 from a shift position switch 26, and change control of a gear ratio is performed according to the shift position. In addition, although the clutch 30 which connects power transfer and is intercepted is formed between the above-mentioned internal combustion engine 12 and the change gear 16 and intermittence control is carried out by the actuator 32 for clutch control, it is usually held at a connection condition.
[0030] The above-mentioned electric motor 14 is connected to the accumulation-of-electricity equipments 36, such as a dc-battery and a capacitor, through the M(motor)/G (generator) control device 34. The rotation drive condition by which electrical energy is supplied from accumulation-of-electricity equipment 36, and a rotation drive is carried out with predetermined torque, It is switched to accumulation-of-electricity equipment 36 by the charge condition of charging electrical energy, and the unloaded condition which permits that a motor shaft rotates freely by functioning as a generator by regenerative braking (electric damping torque of electric motor 14 the very thing). Moreover, as for said internal combustion engine 12, an operating state is controlled by the actuator 42 for fuel-oil-consumption control, the actuator 44 for throttle control, the actuator 46 for ignition timing control, **, the actuator for exhaust air valve controls 48, etc., and actuators, such as it, are controlled by the controller 28 with the above-mentioned M/G control unit 34. In addition, the motor 40 for driving the auxiliary machinery 38, such as a compressor of an air-conditioner, is electrically connected to the above-mentioned accumulation-of-electricity equipment 36.
[0031] A controller 28 is constituted including the microcomputer which has CPU, RAM, ROM, etc., and performs the flow chart shown in drawing 2 - drawing 5 by performing signal processing according to the program set up beforehand. For this controller 28, an engine speed Ne and the input rotational frequency (motor rotational frequency) nickel of a change gear 16 The information about the amount SOC of accumulation of electricity of the output rotational frequency (it corresponds to the vehicle speed V) No, and accumulation-of-electricity equipment 22, The accelerator control input signal showing accelerator control input thetaAC, the brake signal showing the operator having broken in and operated the brake pedal, The brake treading strength signal showing the treading strength, the engine brake shift-position signal showing being the shift position on which engine brake is made to act, etc. are supplied from various kinds of detection means etc. The amount SOC of accumulation of electricity is calculated from a motor current, charging efficiency, etc. at the time of the charge as which an electric motor 14 functions as a generator.
[0032] drawing 2 -- the basic flow chart of this example -- it is -- step S1 -- accelerator control input thetaAC, an engine speed Ne, the input engine speed nickel, the output engine speed No, the amount SOC of accumulation of electricity, an engine torque TE, and motor torque TM etc. -- data are read. Engine torque TE It asks from whenever [throttle valve-opening], fuel oil consumption, etc., and is the motor torque TM. It asks from a motor current etc. At step S2, it judges whether the internal combustion engine (ICE) 12 is out of order from data, such as it, and judges whether the electric motor 14 is out of order in step S3. It is the above-mentioned engine torque TE called for, for example from whenever [throttle valve-opening] etc. about failure of an internal combustion engine 12. Actual engine speed Ne It is the above-mentioned motor torque TM which can judge from relation etc. and is searched for, for example from a motor current etc. about failure of an electric motor 14. Actual motor rotational frequency nickel, i.e., an input rotational frequency, It can judge from relation etc. And at the time of failure of an internal combustion engine 12, ICE fail control of step S6 is performed, motor fail control of step S4 is performed at the time of failure of an electric motor 14, and all, an internal combustion

engine 12 and an electric motor 14 always [of step S5 / forward] perform control, in being normal.
[0033] Drawing 3 is always [of the above-mentioned step S5 / forward] an example of control, and computes the power requirement PL required for transit of a car using operation expression, a data map, etc. which were memorized beforehand from accelerator control input thetaAC, the change rate, the vehicle speed V, etc. in step S5-1. Step S Although it judges whether it is more than the amount A of the minimum accumulation of electricity as which the amount SOC of accumulation of electricity was determined beforehand, and less than [step S5-3] will be performed in 5-2 if it is SOC>=A, in SOC<A, the generation-of-electrical-energy mode subroutine of step S5-8 is performed. When the amount A of the minimum accumulation of electricity runs an electric motor 14 as a driving source, taking out electrical energy from accumulation-of-electricity equipment 36 is the minimum amount of accumulation of electricity permitted, and about 70% of value is set up based on discharge effectiveness, charging efficiency, etc. of accumulation-of-electricity equipment 36. And in the generation-of-electrical-energy mode subroutine of step S5-8 which are performed in SOC<A, while operating an internal combustion engine 12 above the output corresponding to a power requirement PL and making it run a car with a power requirement PL, carry out a rotation drive, an electric motor 14 is made to generate with an excessive output, and accumulation-of-electricity equipment 36 is charged. The output control of the internal combustion engine 12 in this case, i.e., control of an engine torque or a rotational frequency, and generation-of-electrical-energy control of an electric motor 14 are performed in consideration of a change gear ratio of a change gear 16, power loss, etc. in the gear change control of forward always performed by step S5-9.
[0034] In step S5-3 which are performed in SOC>=A, it judges whether a power requirement PL is larger than the 1st boundary value B defined beforehand, and if it is PL>B, it will judge whether it is larger than the 2nd larger boundary value C than the 1st boundary value B at step S5-4. And if it is PL<=B, the motor drive subroutine of step S5-7 will be performed, if it is B<PL<=C, the ICE drive subroutine of step S5-6 will be performed, and if it is PL>C, ICE and the motor drive subroutine of step S5-5 will be performed. Step S In the motor drive subroutine of 5-7, it runs only using an electric motor 14, and it runs only using an internal combustion engine 12, and runs at the ICE drive subroutine of step S5-6 using both an internal combustion engine 12 and the electric motor 14 by ICE and the motor drive subroutine. The output control of an internal combustion engine 12 and an electric motor 14 is performed in consideration of a change gear ratio of a change gear 16, power loss, etc. in the gear change control of forward always to which it is carried out by step S5-9 in any case. Step S An electric motor 14 is made into unloaded condition in the ICE drive subroutine of 5-6, and a clutch 30 is intercepted in the motor drive subroutine of step S5-7.
[0035] Here the 1st boundary value B of the above, and the 2nd boundary value C For example, the driving torque and the vehicle speed V of a car which are operational status as shown in drawing 6 are made into a parameter. Can express for every gear ratio of said change gear 16, and the motor drive subroutine of step S5-7 is performed from the 1st boundary value B in the field by the side of low loading O, i.e., a zero. In the field between the 1st boundary value B and the 2nd boundary value C, the ICE drive subroutine of step S5-6 is performed, and ICE and the motor drive subroutine of step S5-5 are performed in the field by the side of a heavy load from the 2nd boundary value C. That is, the field by the side of low loading is equivalent to the motor driver zone it runs only using a motor from the 1st boundary value B, and the field by the side of a heavy load is equivalent to the engine drive field it runs using an engine from the 1st boundary value B. This 1st boundary value B is set up based on an internal combustion engine's 12 specific fuel consumption (fuel consumption per unit power) and rate of an exhaust gas (amount of exhaust gases per unit power), the energy conversion efficiency of an electric motor 14, etc. so that fuel consumption and the amount of exhaust gases may decrease as much as possible.
[0036] In step S5-9 of the last, change-over control of the gear ratio of said change gear 16 is carried out according to the gear change map (gear change conditions) beforehand set up considering accelerator control input thetaAC and the vehicle speed V which are operational status as a continuous line shows, for example to drawing 7 as a parameter. drawing 7 -- the case of four steps of advance -- i1 -i4

respectively -- a change gear ratio (=nickel / No) -- expressing -- **** -- the magnitude -- i1 >i2 >i3 >i4 it is . In addition, B and C which are shown in drawing 7 with an alternate long and short dash line correspond to said 1st boundary value B and the 2nd boundary value C, and it is run only with an electric motor 14 below the alternate long and short dash line B, is run only with an internal combustion engine 12 between alternate long and short dash lines B and C, and is run by the top [alternate long and short dash line / C] using both an electric motor 14 and the internal combustion engine 12.

[0037] Drawing 4 is an example of ICE fail control of said step S6, and computes a power requirement PL like said step S5-1 in step S6-1. Step S It judges whether it is below the failure time limit constant value D with a larger power requirement PL defined beforehand than said 1st boundary value B, and if it is PL<=D, in step S6-3, actuation of an electric motor 14 will be controlled by 6-2 so that a car is run with a power requirement PL. In PL>D, transit impossible diagnosis is generated in step S6-4, and in step S6-5, actuation of an electric motor 14 is controlled so that a car is run with the failure time limit constant value D, while performing a vision display or a phonological representation of a purport etc. which cannot raise an output any more. Namely, the output limitation by the side of the heavy load of the electric motor [in / as shown in drawing 6 / always / forward] 14 (the 1st boundary value B) It expanded from the 1st boundary value B to the failure time limit constant value D by the side of a heavy load. The part which performs the above-mentioned step S6-2, S6-3, and S6-5 among a series of signal processing by the controller 28 is equivalent to the motor-output limited modification means of claim 3 which is one embodiment of the driver zone modification means of claim 1. This failure time limit constant value D is set up so that it may be satisfied with the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination of the predetermined minimum service conditions -- the predetermined vehicle speed Y (km/h) being obtained or predetermined acceleration Z (G) being obtained at the time of the start under predetermined transit conditions. Moreover, ICE fail control of this drawing 4 , i.e., the part which performs step S6 of said drawing 2 , is equivalent to a drive control means at the time of failure of claim 1.

[0038] In step S6-6 of the last, gear change control of a change gear 16 is performed according to the gear change map at the time of an ICE fail. When a gear change map makes only an electric motor 14 a driving source at the time of this ICE fail and it runs under the power below the above-mentioned failure time limit constant value D, it is determined that gear change control suitable in the field below the broken line D in the inside of the field of accelerator control input thetaAC from which the output of that electric motor 14 specifically changes, i.e., drawing 7 , is performed, and storage means, such as RAM, memorize beforehand so that suitable gear change control may be performed. The broken line D of drawing 7 corresponds to the failure time limit constant value D. In addition, what is necessary is it to be also possible at the time of an ICE fail for to amend the map which asks for a power requirement PL, operation expression, etc., and just to also set gear change control of a change gear 16 to it in 0 - 100% of range in that case so that the power requirement PL required for transit of a car may serve as the failure time limit constant value D when alkali-cellulose control input thetaAC is 100%. The part which performs step S6-6 among a series of signal processing by the controller 28 is equivalent to a gear change control means at the time of failure of claim 5, and the part which performs step S6 of ICE fail control of drawing 4 , i.e., drawing 2 , is equivalent to a drive control means at the time of failure of claim 5.

[0039] A gear change map a gear change line so that it can run also for example, a climb way certainly and may become a low gear from the case of the gear change map of forward always at the time of the above-mentioned ICE fail A high vehicle speed side, The vehicle speed Y predetermined in changing into the right-hand side in drawing 7 **** in the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination (km/h) is obtained, Or the thing acquired for predetermined acceleration Z (G) at the time of the start under predetermined transit conditions, It enables it to perform gear change control, or various modes -- gear change control is made to be performed so that the predetermined minimum service condition may be satisfied and the consumption of the electrical energy by the electric motor 14 may decrease as much as possible -- can be adopted. In order to make it the consumption of the electrical energy by the electric motor 14 decrease Power transmission-efficiency

etaT of a change gear 16 And energy-conversion-efficiency etaM of an electric motor 14 It uses. The dc-battery consumption EBOUT is calculated according to a degree type (1), changing the gear ratio of a change gear 16. The part which performs step S6-6 in that case functions as an energy-saving gear change control means of claim 6 that what is necessary is just to set up a gear change map so that it may run for the gear ratio from which the dc-battery consumption EBOUT serves as min. In addition, power transmission-efficiency etaT of a change gear 16 A gear ratio, transfer torque, etc. are searched for as a parameter, and it is energy-conversion-efficiency etaM of an electric motor 14. Motor torque and a motor rotational frequency are called for as a parameter.

EBOUT=PL/(etaT xetaM) ... (1)

[0040] Here, in ICE fail control of this drawing 4 , since the output limitation by the side of the heavy load of an electric motor 14 (the 1st boundary value B) is expanded from it to the failure time limit constant value D by the side of a heavy load, it becomes possible to perform heavy load transit of a climb way etc. by making only an electric motor 14 into a driving source. Moreover, since change-over control of the gear ratio is carried out according to the gear change map at the time of the engine failure set that suitable gear change control is performed when running by making only an electric motor 14 into a driving source under the power below the above-mentioned failure time limit constant value D, a change gear 16 can reduce the amount of electrical energy consumption by the electric motor 14, securing predetermined performance-traverse ability. That is, while performance-traverse ability is raised by such an output control of an electric motor 14 and gear change control of a change gear 16, reducing the amount of electrical energy consumption and the transit under the transit conditions which were conventionally impossible for transit is attained, with the electrical energy with which accumulation-of-electricity equipment 36 was restricted, sufficient mileage can be secured now and it can run to the predetermined destination. In addition, although charge is performed to accumulation-of-electricity equipment 36 also in the time of such an ICE fail by regenerative braking at the time of brakes operation etc., since said step S5-8 which charge with an internal combustion engine 12 become impossible, charges run short compared with always [forward].

[0041] Moreover, a gear change map is power transmission-efficiency etaT of a change gear 16 at the time of the above-mentioned engine failure. And energy-conversion-efficiency etaM of an electric motor 14 It takes into consideration, and when being set up so that the consumption of the electrical energy by the electric motor 14 may serve as min, and gear change control may be performed, the consumption of electrical energy is reduced further and the long-distance transit of it is attained.

[0042] Moreover, in this ICE fail control, since the transit using an electric motor 14 is continued even if the amount SOC of accumulation of electricity does not change drive control like control by whether it is more than the amount A of the minimum accumulation of electricity at the time of normal of drawing 3 and the amount SOC of accumulation of electricity is less than the amount A of the minimum accumulation of electricity, the mileage it can run with an electric motor 14 can fully be secured, and it can run to the predetermined destination. That is, ICE fail control of step S6 without the limit by the amount SOC of accumulation of electricity is functioning also as an amount modification means of the minimum accumulation of electricity of claim 7.

[0043] In addition, although the upper example explained the case where the output limitation by the side of the heavy load of an electric motor 14 (the 1st boundary value B) was expanded to the failure time limit constant value D by the side of a heavy load It can also be possible to reduce the output limitation (the 1st boundary value B) to a low loading side like the broken line E of drawing 6 , the consumption of the electrical energy by the electric motor 14 can be reduced in that case, and mileage sufficient with the electrical energy with which accumulation-of-electricity equipment 36 was restricted can be secured now. Such an embodiment is equivalent to one example of claim 4.

[0044] On the other hand, drawing 5 is an example of motor fail control of said step S4, and computes a power requirement PL like said step S5-1 in step S4 -1. It judges whether it is beyond the failure time limit constant value E with a power requirement PL smaller than said 1st boundary value B defined beforehand, and if it is PL>=E, in step S4 -3, an internal combustion engine's 12 actuation will be controlled by step S4 -2 so that a car is run with a power requirement PL. In PL<E, transit impossible

diagnosis is generated in step S4 -4, and in step S4 -5, an internal combustion engine's 12 actuation is controlled so that a car is run with the failure time limit constant value E, while performing a vision display or a phonological representation of a purport etc. which cannot lower an output any more. Namely, the output limitation by the side of the internal combustion engine's [in / as shown in drawing 6 / always / forward] 12 low loading (the 1st boundary value B) It expanded and carried out from the 1st boundary value B to the failure time limit constant value E by the side of low loading. The part which performs above-mentioned step S4 -2, S4 -3, and S4 -5 among a series of signal processing by the controller 28 is equivalent to the engine power limited modification means of claim 2 which is one embodiment of the driver zone modification means of claim 1. It is determined that the low-speed transit which departs from it and stops a car smoothly is possible for this failure time limit constant value E. Moreover, the part which performs motor fail control of this drawing 5 , i.e., step S4 of said drawing 2 , is equivalent to a drive control means at the time of failure.

[0045] In last step S4 -6, gear change control of a change gear 16 is performed according to the gear change map at the time of a motor fail. when a gear change map make only an internal combustion engine 12 a driving source at the time of this motor fail and it run under the power beyond the above-mentioned failure time limit constant value E , it be determine that it run for the gear ratio from which it be a field more than the broken line E in the inside of the field of accelerator control input thetaAC from which that internal combustion engine 12 output specifically change , i.e. , drawing 7 , for example , fuel consumption serve as min , and it be beforehand memorize by storage means , such as RAM , so that suitable gear change control may be perform . The broken line E of drawing 7 corresponds to the failure time limit constant value E. In addition, what is necessary is it to be also possible at the time of a motor fail for to amend the map which asks for a power requirement PL, operation expression, etc., and just to also set gear change control of a change gear 16 to it in 0 - 100% of range in that case so that the power requirement PL required for transit of a car may serve as the failure time limit constant value E when alkali-cellulose control input thetaAC is 0%. The part which performs step S4 -6 among a series of signal processing by the controller 28 is equivalent to a gear change control means at the time of failure of claim 5, and the part which performs motor fail control of drawing 5 , i.e., step S4 of drawing 2 , is equivalent to a drive control means at the time of failure of claim 5.

[0046] Here, in motor fail control of this drawing 5 , since the output limitation by the side of an internal combustion engine's 12 low loading (the 1st boundary value B) is expanded from it to the failure time limit constant value E by the side of low loading, it becomes possible to perform low-speed transit at the time of start and a halt etc. good by making only an internal combustion engine 12 into a driving source. Moreover, since change-over control of the gear ratio is carried out according to the gear change map at the time of the motor failure set that suitable gear change control is performed when running only an internal combustion engine under the power beyond the above-mentioned failure time limit constant value E, using only an internal combustion engine 12 as a driving source, a change gear 16 can reduce the fuel consumption by the internal combustion engine 12, securing predetermined performance-traverse ability. Namely, performance-traverse ability is raised by such an internal combustion engine's 12 output control and gear change control of a change gear 16, reducing fuel consumption, the transit under the transit conditions which were conventionally impossible for transit is attained, and it can run now to the predetermined destination.

[0047] Thus, according to the hybrid driving gear 10 of this example, even if either the internal combustion engine 12 which is a driving source, and the electric motor 14 break down, it is run good using the driving source of another side, and can run to the predetermined destination.

[0048] Next, other examples of this invention are explained. In addition, the same sign is given to the part which is substantially common in said example in the following examples, and detailed explanation is omitted.

[0049] Drawing 8 is a block diagram explaining the outline configuration of the hybrid driving gear 50 of a series mold, it has the generator 52 which generates electrical energy by carrying out a rotation drive by the internal combustion engine 12, and an electric motor 14 runs only the electric motor 14 as a driving source while being operated by the electrical energy accumulated in the electrical energy and/or

the accumulation-of-electricity equipment 36 which were taken out with the generator 52. Drawing 9 is a basic flow chart explaining actuation of this hybrid driving gear 50. At step R1, accelerator control input thetaAC, an engine speed Ne, and the input rotational frequency (motor rotational frequency) nickel the output engine speed No, the amount SOC of accumulation of electricity, an engine torque TE, and motor torque TM Data are read. etc. -- If all are normal, while judging whether the internal combustion engine (ICE) 12 or the generator 52 is out of order from data, such as it, at step R2, and always [of step R3 / forward] performing control, when either is also out of order, control is performed at the time of the fail of step R4. It is the engine torque TE called for, for example from whenever [throttle valve-opening] etc. about failure of an internal combustion engine 12. Actual engine speed Ne It can judge from relation etc. and failure of a generator 52 can be judged from the relation of the engine speed Ne and generating current value which are the engine speed of a generator 52 etc.

[0050] Although drawing 10 is always [of the above-mentioned step R3 / forward] an example of control, and the power requirement PL required for transit of a car is computed like said example, and it judges whether it is more than the amount A of the minimum accumulation of electricity as which the amount SOC of accumulation of electricity was beforehand determined in step R3-2, and less than [step R3-3] will be performed in step R3-1 if it is SOC>=A, as for the case of SOC<A, the charge mode subroutine of step R3-6 is performed. In this charge mode subroutine, while operating an electric motor 14 so that it may be made to run a car with a power requirement PL, an internal combustion engine 12 is operated so that a generator 52 may generate much electrical energy from electrical energy required for actuation of that electric motor 14, and excessive electrical energy is charged at accumulation-of-electricity equipment 36. The output of an electric motor 14 is controlled in consideration of the change gear ratio of the change gear 16 in the gear change control of forward always performed by step R3-7.

[0051] In step R3-3 which are performed in SOC>=A, it judges whether a power requirement PL is larger than the boundary value F defined beforehand, if it is PL>F, the ICE actuation motor drive subroutine of step R3-4 will be performed, and if it is PL<=F, the ICE halt motor drive subroutine of step R3-5 will be performed. Step R An electric motor 14 is operated so that it may be made to run a car with a power requirement PL, and in the ICE actuation motor drive subroutine of 3-4, operating an internal combustion engine 12 and generating electrical energy with a generator 52, if there are more amounts of electrical energy generated with a generator 52 than the amount of consumption electrical energy of an electric motor 14, the excessive electrical energy is charged by accumulation-of-electricity equipment 36, and when fewer than the amount of consumption electrical energy, only an insufficiency will be taken out from charging equipment 36. Moreover, in the ICE halt motor drive subroutine of step R3-5, while suspending an internal combustion engine 12, an electric motor 14 is operated so that it may be made to run a car with a power requirement PL. Boundary value F can be expressed for every gear ratio of said change gear 16 by making into a parameter the driving torque and the vehicle speed V of a car which are operational status, as shown in drawing 12 , in the field by the side of low loading O, i.e., a zero, the ICE halt motor drive subroutine of step R3-5 is performed from boundary value F, and the ICE actuation motor drive subroutine of step R3-4 is performed in the field by the side of a heavy load from boundary value F. The output of an electric motor 14 is controlled in consideration of the change gear ratio of the change gear 16 in the gear change control of forward always to which it is carried out by step R3-7 in any case.

[0052] In step R3-7 of the last, change-over control of the gear ratio of said change gear 16 is carried out according to the gear change map (gear change conditions) beforehand set up like said example considering accelerator control input thetaAC and the vehicle speed V as a parameter.

[0053] Drawing 11 is an example of fail control of said step R4, and computes a power requirement PL like said example in step R4-1. Step R It judges whether it is below the failure time limit constant value G with a larger power requirement PL defined beforehand than said boundary value F, and if it is PL<=G, in step R4-3, actuation of an electric motor 14 will be controlled by 4-2 so that a car is run with a power requirement PL. In PL>G, transit impossible diagnosis is generated in step R4-4, and in step R4-5, actuation of an electric motor 14 is controlled so that a car is run with the failure time limit constant value G, while performing a vision display or a phonological representation of a purport etc.

which cannot raise an output any more. In control of this etc., all electrical energy required for actuation of an electric motor 14 is taken out from accumulation-of-electricity equipment 36. The field below the failure time limit constant value G to which transit control is carried out at the time of this fail is equivalent to a driver zone at the time of failure of claim 8, and the part which performs fail control R4 of drawing 11 , i.e., the step of said drawing 9 , is equivalent to a motorised control means at the time of failure of claim 8. In addition, the above-mentioned failure time limit constant value G is set up so that it may be satisfied with the bottom of the transit conditions predetermined [, such as X etc. degrees,] in inclination of the predetermined minimum service conditions -- the predetermined vehicle speed Y (km/h) being obtained or predetermined acceleration Z (G) being obtained at the time of the start under predetermined transit conditions.

[0054] In step R4-6 of the last, gear change control of a change gear 16 is performed according to the gear change map at the time of a fail. At the time of this fail, when running by making an electric motor 14 into a driving source under the power below the above-mentioned failure time limit constant value G, gear change control is performed like step S6-6 in said example so that suitable gear change control may be performed. In that case, when being set up so that it may run for the gear ratio from which the dc-battery consumption EBOUT asked for a gear change map by the aforementioned (1) formula serves as min at the time of a fail, the part which performs step R4-6 functions as an energy-saving gear change control means of claim 6.

[0055] Thus, since according to the hybrid driving gear 50 of this example a car is run by the electric motor 14 in the low loading field below the failure time limit constant value G when an internal combustion engine 12 or a generator 52 breaks down, even if the consumption of the electrical energy by the electric motor 14 is reduced, the generation of electrical energy with a generator 52 serves as impossible and supply of electrical energy is intercepted, mileage sufficient with the electrical energy with which accumulation-of-electricity equipment 36 was restricted is securable. Moreover, since it is controlled to take out all electrical energy required for actuation of an electric motor 14 from accumulation-of-electricity equipment 14, it is avoided that running becomes impossible insufficient [supply of the electrical energy to an electric motor 14] therefore. Thereby, even if electrical energy is no longer charged by accumulation-of-electricity equipment 36 by failure of an internal combustion engine 12 or a generator 52, it can reach to the predetermined destination. In addition, although control which charges the electrical energy which this example also made carry out regenerative braking of the electric motor 14 at the time of brakes operation etc., and generated it at accumulation-of-electricity equipment 36 is performed, since charge by the internal combustion engine 12 becomes impossible, charges run short compared with always [forward].

[0056] Moreover, the gear change map at the time of a fail is power transmission-efficiency etaT of a change gear 16. And energy-conversion-efficiency etaM of an electric motor 14 It takes into consideration, and when being set up so that the consumption of the electrical energy by the electric motor 14 may serve as min, and gear change control may be performed, the consumption of electrical energy is reduced further and the long-distance transit of it is attained.

[0057] Moreover, the mileage it can run with an electric motor 14 since transit according [even if the amount SOC of accumulation of electricity does not change drive control like control in fail control of this example by whether it is more than the amount A of the minimum accumulation of electricity at the time of normal of drawing 10 and the amount SOC of accumulation of electricity is less than the amount A of the minimum accumulation of electricity, take out all electrical energy from accumulation-of-electricity equipment 36, and] to an electric motor 14 is continued can fully be secured, and it can run now to the predetermined destination. That is, fail control of step R4 without the limit by the amount SOC of accumulation of electricity is functioning also as an amount modification means of the minimum accumulation of electricity of claim 7.

[0058] As mentioned above, although the example of this invention was explained to the detail based on the drawing, this invention can also be carried out in other modes.

[0059] For example, although the change gear 16 of said example was equipped with the pre-go-astern change-over device, it is also possible to switch the hand of cut of an electric motor 14, and to make it

move forward and retreat a car.
[0060] moreover, although the clutch 30 was formed between the internal combustion engine 12 and the change gear 16 in the example of said drawing 1 , it is possible to arrange a clutch also between a change gear 16 and an electric motor 14 -- etc. -- arrangement gestalten, such as a clutch, may be changed suitably.
[0061] Moreover, this invention may be similarly applied to the hybrid driving gear which compounds the output of an internal combustion engine 12 and an electric motor 14 with an epicyclic gear drive, and is transmitted to a change gear 16 side.
[0062] In addition, although instantiation is not carried out one by one, this invention can be carried out in the mode which added various modification and amelioration based on this contractor's knowledge.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] When either an engine or a motor breaks down, it may be unable to become transit impossible, or it becomes impossible to secure sufficient mileage and may be able to stop however, being able to reach to the predetermined destination in the hybrid driving gear of the above-mentioned parallel mold. Since it charges using rotation of an engine or regenerative braking, it becomes insufficient by failure of an engine charging accumulation-of-electricity equipment, and it becomes impossible for example, to have to run with a motor, if an engine breaks down, but to secure sufficient mileage, while its torque is insufficient at the time of heavy loads, such as a climb way, and it becomes transit impossible at it, since the motor driver zone which runs with a motor is a low loading field. Moreover, when a motor breaks down, it must run with an engine, but since the engine drive field which runs using an engine is a heavy load field, low loading transit, i.e., the low-speed transit at the time of start and a halt etc., is impossible, and it serves as transit impossible substantially. Furthermore, in the hybrid driving gear which has the change gear with which a change gear ratio is changed according to operational status, if a change gear ratio is changed like always [forward] according to operational status, such as an accelerator control input, even when one side of a driving source breaks down, performance-traverse ability is spoiled greatly, without the power and the change gear ratio which are transmitted from a driving source matching, it will become transit impossible or mileage will fall remarkably.
[0004] In the case of the hybrid driving gear of a series mold, if the motor which is a driving source breaks down, naturally it will become transit impossible, but even when an engine and a generator break down, the supply of the electrical energy from a generator by which a rotation drive is carried out with an engine is intercepted, and since a motor is operated with the electrical energy of accumulation-of-electricity equipment, if heavy load transit with bad energy efficiency is performed, sufficient mileage cannot be secured chiefly. Moreover, when the rate of the amount taken out from accumulation-of-electricity equipment among electrical energy required for actuation of a motor is controlled, by intercepting supply of the electrical energy from a generator, the electrical energy supplied to a motor runs short, sufficient output is no longer obtained, and running may become impossible.
[0005] With a parallel mold, when either an engine and a motor break down, the place which succeeded in this invention against the background of the above situation, and is made into the purpose is in a series mold, to enable it to run to the predetermined destination, respectively, when an engine or a generator breaks down.

[Translation done.]

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MEANS

[Means for Solving the Problem] The 1st invention is (a) in order to attain this purpose. The engine which operates by combustion of a fuel, (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) While having the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates and using the engine and motor as a driving source at the time of car transit In the hybrid driving gear with which the engine drive field by the side of the heavy load it runs using the motor driver zone and engine by the side of the low loading it runs only using a motor according to operational status was appointed beforehand (d) At the time of the failure which uses and runs the driving source of another side when either said motor or said engine breaks down, drive control means, (e) At the time of the transit using the driving source of said another side by the drive control means, it is characterized by having a driver zone modification means to change the driver zone by the driving source of the another side at the time of the failure.
[0007] The 2nd invention is characterized by said driver zone modification means being a thing including an engine power limited modification means to expand the output limitation by the side of the low loading of the engine corresponding to said engine drive field to a low loading side when the driving source of said another side is said engine in the hybrid driving gear of the 1st invention of the above.
[0008] The 3rd invention is characterized by said driver zone modification means being a thing including a motor-output limited modification means to expand the output limitation by the side of the heavy load of the motor corresponding to said motor driver zone to a heavy load side when the driving source of said another side is said motor in the hybrid driving gear of said 1st invention or the 2nd invention.
[0009] The 4th invention is characterized by said driver zone modification means being a thing including a motor-output limited modification means to reduce the output limitation by the side of the heavy load of the motor corresponding to said motor driver zone to a low loading side when the driving source of said another side is said motor in the hybrid driving gear of said 1st invention or the 2nd invention.
[0010] The 5th invention is (a). The engine which operates by combustion of a fuel, and (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) The motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates, (d) It has the change gear which changes a change gear ratio according to operational status while transmitting rotation of said engine as a driving source and said motor to a wheel side. In the hybrid driving gear which uses properly and runs said motor and said engine according to operational status (e) At the time of the failure which uses and runs the driving source of another side when either said motor or said engine breaks down, drive control means, (f) At the time of the transit using the driving source of said another side by the drive control means, it is characterized by having a gear change control means at the time of the failure which changes the relation of said operational status and said change gear ratio at the time of the failure.
[0011] The 6th invention is (a). The engine which operates by combustion of a fuel, and (b)

Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) In the hybrid driving gear have the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates, and the change gear which can change a change gear ratio, and using this motor as a driving source at the time of car transit at least (d) So that the amount of electrical energy which said motor consumes may become small, when said engine breaks down It is characterized by having the energy-saving gear change control means which controls the change gear ratio of this change gear in consideration of either [at least] the power transmission efficiency of said change gear, or the energy conversion efficiency of said motor.

[0012] The 7th invention is (a). The engine which operates by combustion of a fuel, and (b) Accumulation-of-electricity equipment with which electrical energy is charged based on rotation of the engine, (c) While having the motor which takes out electrical energy from the accumulation-of-electricity equipment, and operates and using the motor as a driving source at the time of car transit at least In the hybrid driving gear with which the amount of the minimum accumulation of electricity of the accumulation-of-electricity equipment with which taking out electrical energy from said accumulation-of-electricity equipment in order to operate the motor is permitted is set up (d) When said engine breaks down, it is characterized by having the amount modification means of the minimum accumulation of electricity which lowers the amount of the minimum accumulation of electricity of said accumulation-of-electricity equipment.

[0013] The 8th invention is (a). The engine which operates by combustion of a fuel, and (b) The generator which generates electrical energy by carrying out a rotation drive with the engine, (c) Accumulation-of-electricity equipment which accumulates the electrical energy taken out with the generator, (d) It has the motor which operates with the electrical energy accumulated in the electrical energy taken out with said generator, and/or said accumulation-of-electricity equipment. It sets to the hybrid driving gear using the motor as a driving source at the time of car transit, and is (e). When said engine or generator breaks down, at the time of the failure by the side of the low loading defined beforehand in the range of a driver zone It is characterized by having a motorised control means at the time of the failure which you take [failure] out all electrical energy required for actuation of said motor from said accumulation-of-electricity equipment, and makes it run a car with the motor.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is a block diagram explaining the configuration of the parallel mold hybrid driving gear which is one example of this invention.
[Drawing 2] It is a flow chart explaining basic actuation of the hybrid driving gear of drawing 1 .
[Drawing 3] It is the flow chart which always [of step S5 in drawing 2 / forward] explains the concrete contents of control.
[Drawing 4] It is a flow chart explaining the concrete contents of ICE fail control of step S6 in drawing 2 .
[Drawing 5] It is a flow chart explaining the concrete contents of motor fail control of step S4 in drawing 2 .
[Drawing 6] It is drawing explaining the boundary value B and C of drawing 3 , the failure time limit constant value D of drawing 4 , and the failure time limit constant value E of drawing 5 .
[Drawing 7] It is drawing which always [of step S5-9 / forward] in drawing 3 explains the gear change map of gear change control.
[Drawing 8] It is a block diagram explaining the configuration of the series mold hybrid driving gear which is one example of this invention.
[Drawing 9] It is a flow chart explaining basic actuation of the hybrid driving gear of drawing 8 .
[Drawing 10] It is the flow chart which always [of step R3 in drawing 9 / forward] explains the concrete contents of control.
[Drawing 11] It is a flow chart explaining the concrete contents of fail control of step R4 in drawing 9 .
[Drawing 12] It is drawing explaining the boundary value F of drawing 10 , and the failure time limit constant value G of drawing 11 .
[Description of Notations]
10 50: Hybrid driving gear
12: Internal combustion engine (engine)
14: Electric motor (motor)
16: Change gear
36: Accumulation-of-electricity equipment
52: Generator
Step S4: It is a drive control means at the time of failure.
Step S4 -2, S4 -3, S4 -5: Engine power limited modification means
Step S4 -6: They are a gear change control means and an energy-saving gear change control means at the time of failure.
Step S6: They are a drive control means and the amount modification means of the minimum accumulation of electricity at the time of failure.
Step S6-2, S6-3, S6-5: Motor-output limited modification means
Step S6-6: They are a gear change control means and an energy-saving gear change control means at the time of failure.

Step R4: They are a motorised control means and the amount modification means of the minimum accumulation of electricity at the time of failure.
Step R4-6: Energy-saving gear change control means

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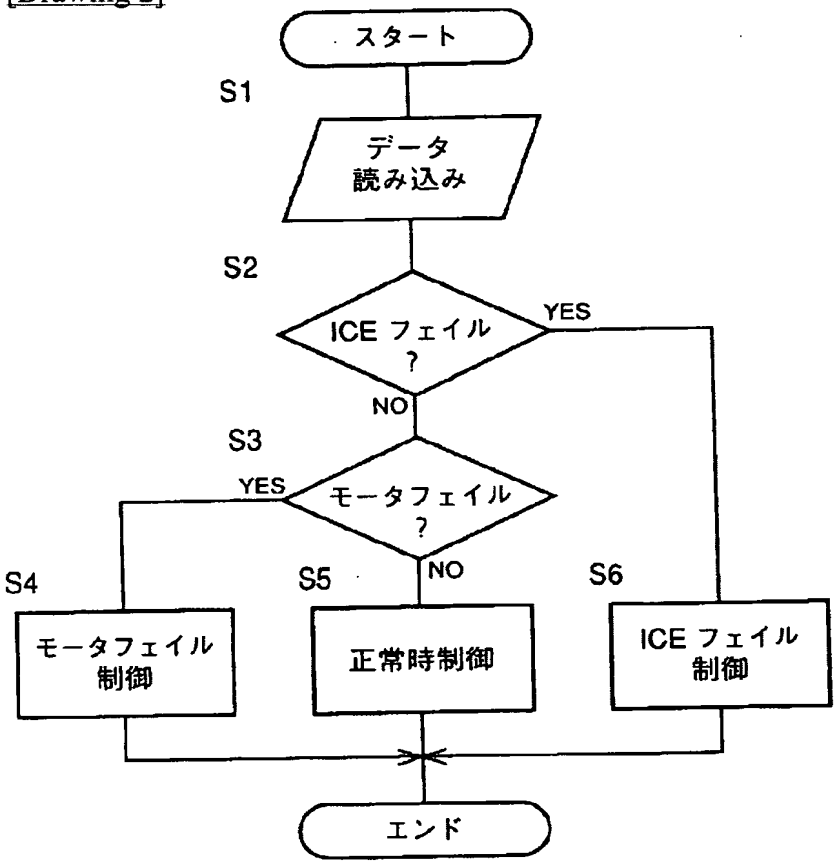
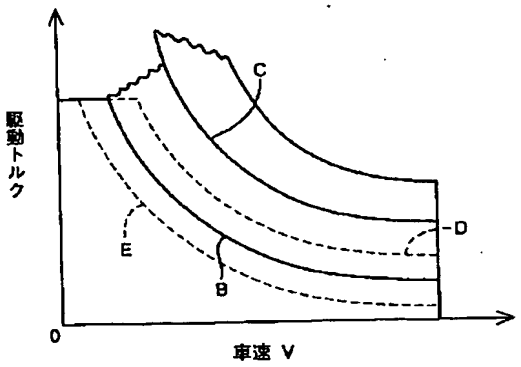
DRAWINGS

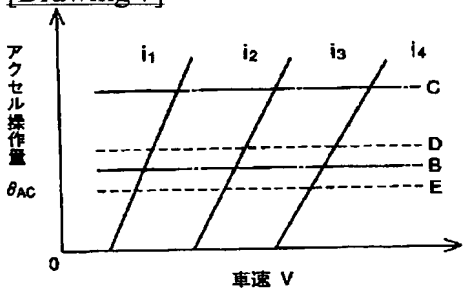
[Drawing 2]



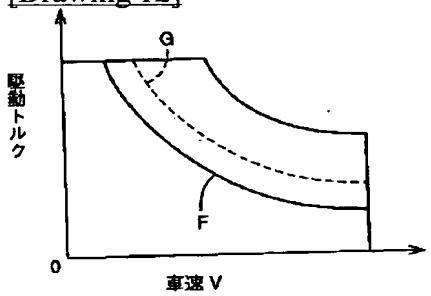
[Drawing 6]



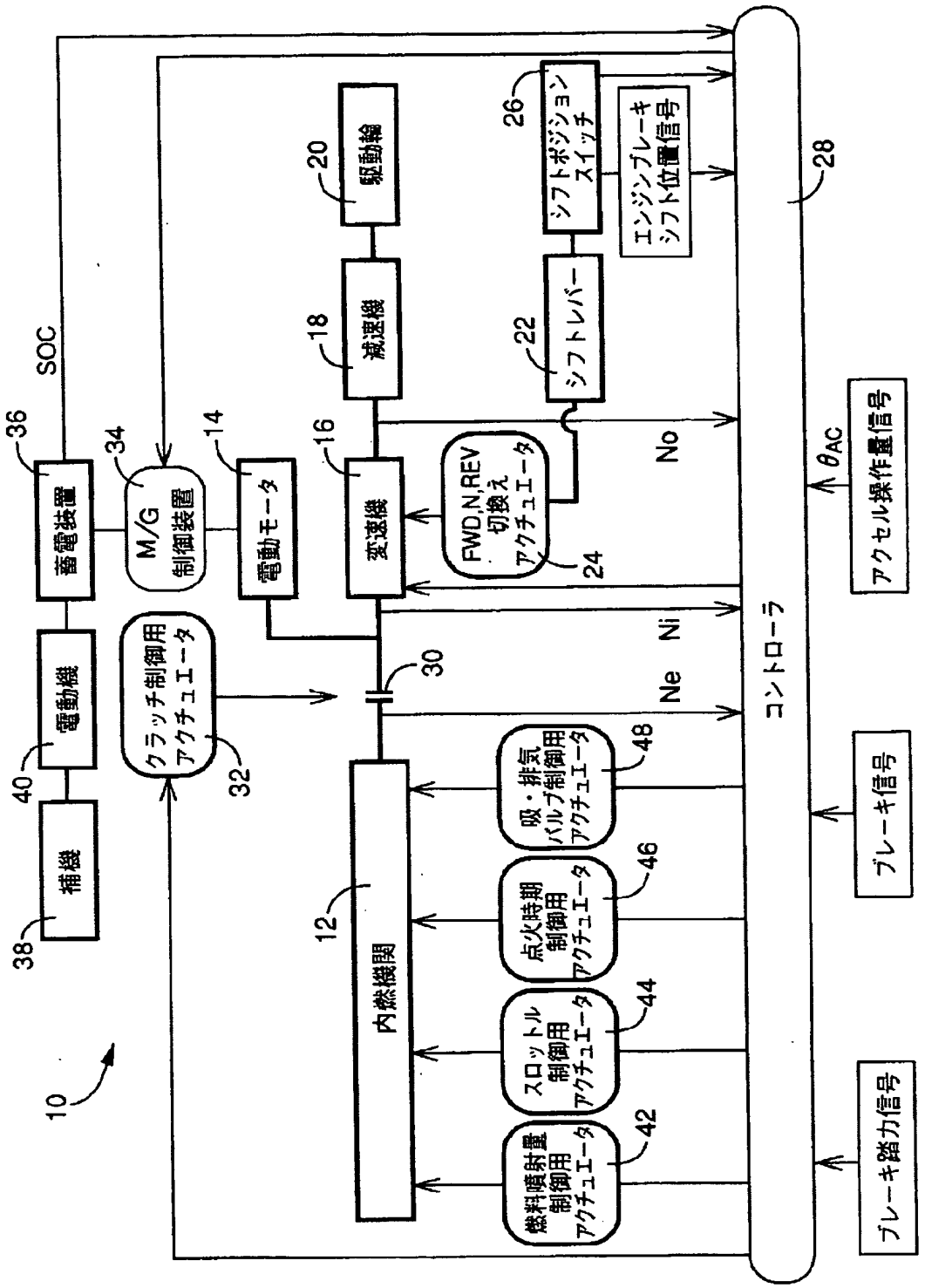
[Drawing 7]



[Drawing 12]



[Drawing 1]


10
12
内燃機関
14
電動モータ
16
変速機
18
減速機
20
駆動輪
22
シフトレバー
24
FWD,N,REV 切換え アクチュエータ
26
シフトポジション スイッチ
28
コントローラ
30
32
クラッチ制御用 アクチュエータ
34
M/G 制御装置
36
蓄電装置
38
補機
40
電動機
42
燃料噴射量 制御用 アクチュエータ
44
スロットル 制御用 アクチュエータ
46
点火時期 制御用 アクチュエータ
48
吸・排気 バルブ制御用 アクチュエータ
SOC
No
Ni
Ne
θAC
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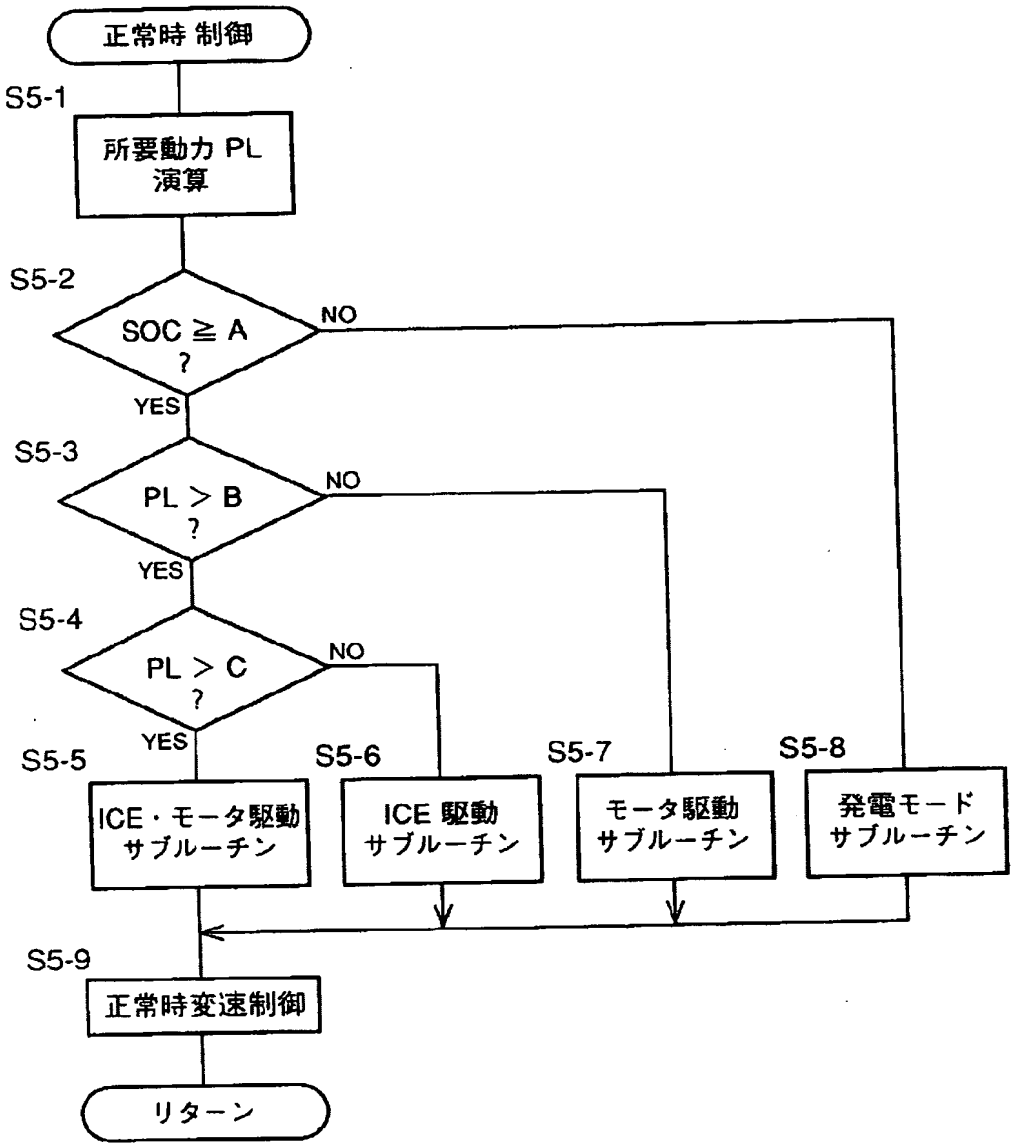
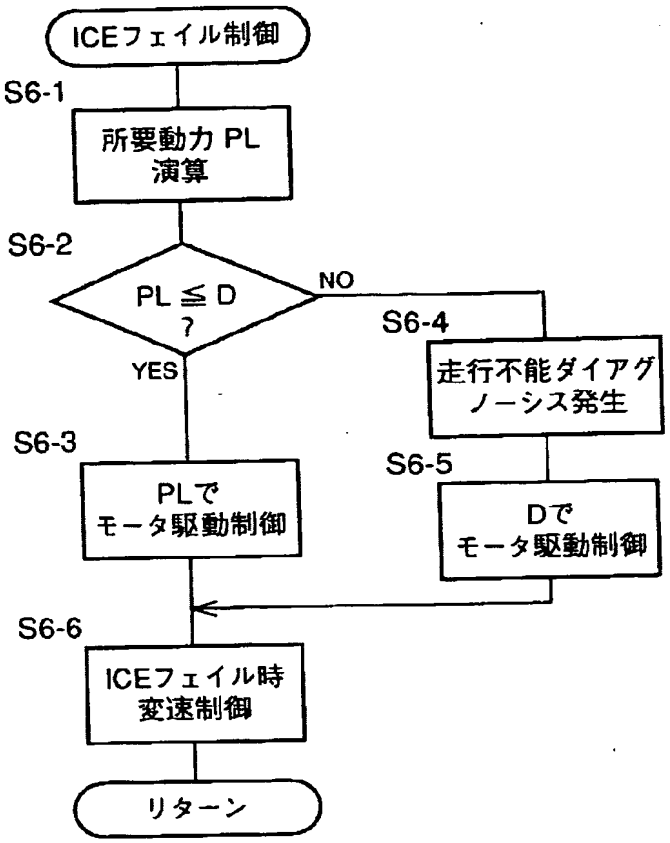
アクセル操作量信号
ブレーキ信号
ブレーキ踏力信号

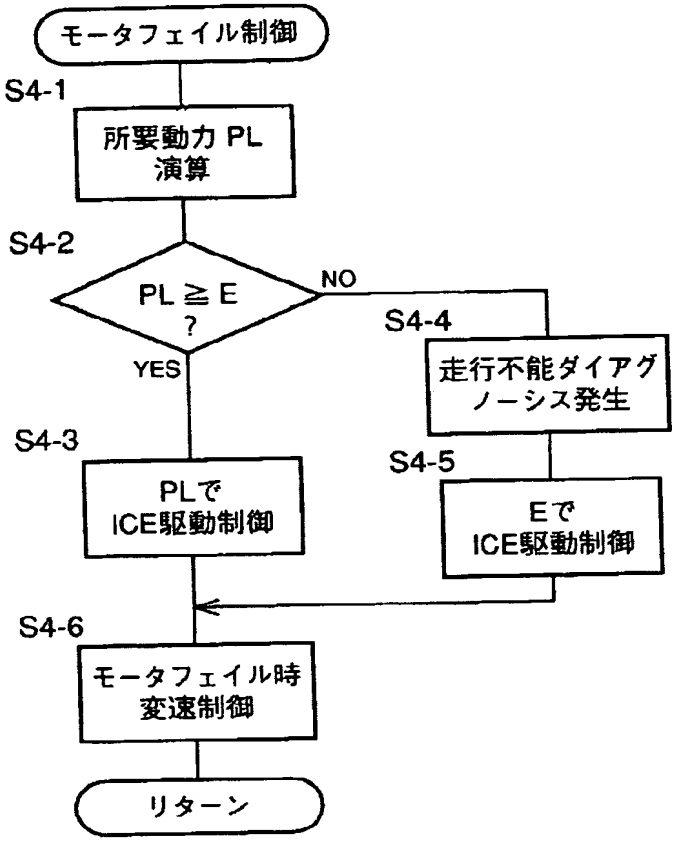
[Drawing 3]


正常時 制御
S5-1
所要動力 PL
演算
S5-2
SOC ≧ A
?
NO
YES
S5-3
PL > B
?
NO
YES
S5-4
PL > C
?
NO
YES
S5-5
ICE・モータ駆動
サブルーチン
S5-6
ICE 駆動
サブルーチン
S5-7
モータ駆動
サブルーチン
S5-8
発電モード
サブルーチン
S5-9
正常時変速制御
リターン

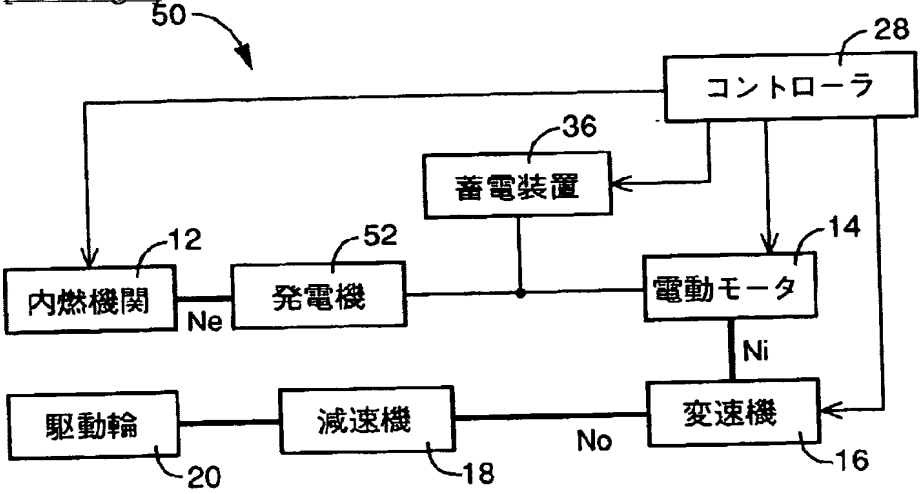
[Drawing 4]


ICEフェイル制御
S6-1
所要動力 PL
演算
S6-2
PL ≦ D
?
NO
YES
S6-4
走行不能ダイアグ
ノーシス発生
S6-3
PLで
モータ駆動制御
S6-5
Dで
モータ駆動制御
S6-6
ICEフェイル時
変速制御
リターン

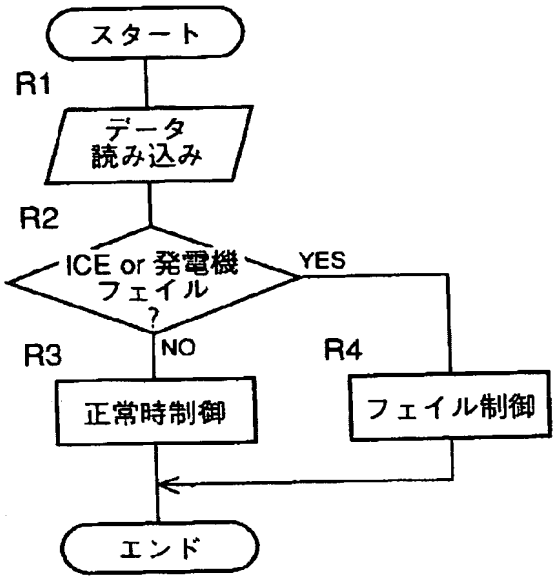
[Drawing 5]



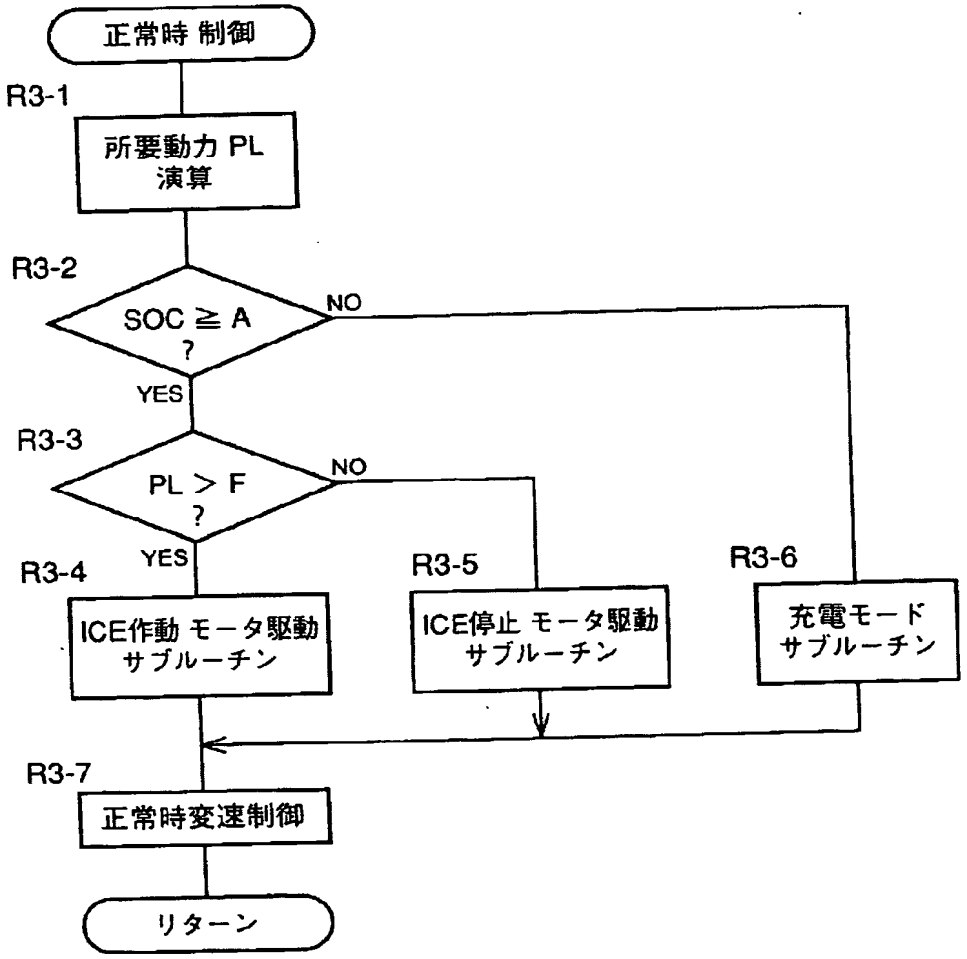
[Drawing 8]



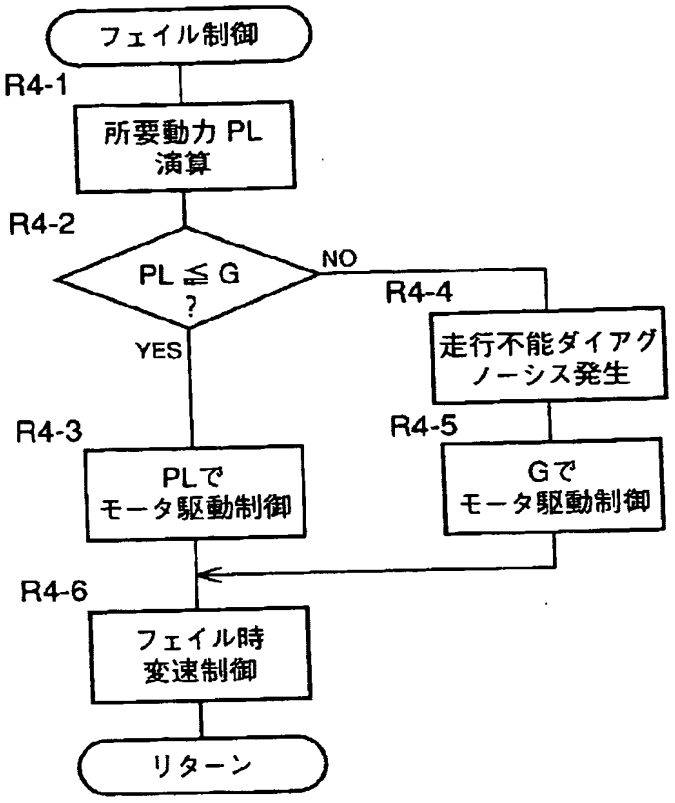
[Drawing 9]



[Drawing 10]



[Drawing 11]



[Translation done.]